

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

SIEGE INDUSTRIES, INC.

v.

Plaintiff,

CLARK MANUFACTURING, INC.

Defendant.

CIVIL ACTION NO.
H-94-3180

**SUPPLEMENT TO EXPERT WITNESS REPORT OF ALBERT B. KIMBALL JR.
UNDER FEDERAL RULE 26(a)(2)(B)**

This will supplement my earlier report dated February 1, 1996. This supplement is necessary to give a claim-by-claim invalidity analysis based on the claims of U.S. Patent No. 5,361,215 (attachment A) asserted by the Plaintiff to be infringed by the Defendant as set forth in the Expert Report of John K. Bennett, dated February 1, 1996. Prior to Dr. Bennett's report it was only possible to prepare a summary analysis of invalidity. Now that it is established that Plaintiff is only asserting claims 1, 2, 4 and 37 as infringed, I am able to supplement my report of February 1, 1996 in order to set forth my specific opinion, the basis for my opinion and the supporting documentation as now directed to the only asserted claims.

As previously indicated, I have reviewed the cited prior art, as well as publications, testimony, and other exhibits developed during the discovery proceedings in this litigation. In addition, I am currently undertaking an independent review of additional published patents on file in the United States Patent and Trademark Office. When that review is complete, I will again supplement my report and Defendant Clark will file a notice of all art relied on, in accordance with 35 U.S.C. §282.

This supplement is directed to additional comments under paragraph 5 of my report dated February 1, 1996.

5. (supplemented). It is my opinion that each of the asserted claims 1, 2, 4 and 37 is invalid as anticipated by the prior art under 35 U.S.C. §102 or in the alternative is invalid as obvious in view of the prior art under 35 U.S.C. §103.

The basis for this opinion is as follows:

Claim 1 is directed to a spa control system having a heating element, a first sensor for detecting temperature of the water at the spa, a second sensor for detecting temperature of water at the heating element and a microcomputer for processing signals generated by said sensors.

I have reviewed the prior art spa control system identified as the SPATROL control, specifically the SPATROL SCS-1 computerized system shown in Deposition Exhibits 134-22, 134-23, 134-24, 134-25, 134-27 (attachment B) and physical Deposition Exhibits 131 and 132, identified in the deposition Lloyd H. Buck (excerpts attachment C) at page 51, line 6. As stated by Mr. Buck in his deposition, at page 55, line 5 through page 58, line 3 and at page 61, line 9 through line 21, the SPATROL device meets each and every element of claim 1.

This evidence supports my conclusion and opinion that the spa control system set forth in claim 1 of the patent in suit is fully anticipated by the SPATROL SCS-1 control and that claim 1 is invalid under 35 USC §102.

In any event, the SPATROL SCS-1 control operates in exactly the same manner as the Sundance control to perform exactly the same functions to accomplish exactly the same result as called for in claim 1. Therefore, even if the SPATROL control is not found to anticipate claim 1 of the patent, the defendant's device could not be found to infringe since it is merely a copy of the prior art device.

Additional prior art developed during the course of this litigation also fully anticipates claim 1 of the patent in suit. Deposition Exhibits 141 through 141-12 (attachment D) conclusively illustrate that the control system as claimed in claim 1 of the patent was previously invented by Mr. Allan Pinkul of Balboa Instruments Inc. before the earliest possible invention date of the patent in suit and was publicly disclosed to Sundance more than one year prior to the first application for patent. This is supported by the deposition testimony of Mr. Pinkul (excerpts attachment E), see page 38, line 20 through page 49, line 16.

In addition, the Eaton Spa Monitor II, available in 1983 as disclosed in Deposition Exhibit 159, 159-2 (attachment F) also fully discloses the device set forth in claim 1 of the patent.

It is my opinion that Claim 1 of the patent in suit is clearly invalid under 35 USC §102 as anticipated by the SPATROL control, the Balboa Control and the Eaton Spa Monitor II.

Further, the state of the art as demonstrated by the work of Balboa, Spatrol and Eaton, clearly illustrates that the alleged invention set forth in the patent in suit would have been obvious to one of ordinary skill in the art at the time the alleged invention was made, making the invention obvious under 35 USC §103 and invalid.

Claim 2 of the patent in suit identifies the location of the sensors in the device of claim 1. The Sundance location of sensors is precisely the same location as used in the SPATROL SCS-1, the Balboa device, and in all other known electro-mechanical devices as developed during the discovery phase of this litigation. This claim is fully anticipated under 35 USC §102 for the same reasons set forth regarding Claim 1. In any event, the established state of the art based on the Balboa, Spatrol and Eaton efforts clearly establish that the invention as set forth in claim 2 was obvious under 35 USC §103.

Claim 4 requires that the microprocessor calculates the difference between the temperatures detected by the sensors. First, it should be pointed out the Richard Palm testimony relied on by Dr. Bennett does not support a finding that the Sundance control calculates the difference between the sensors. In fact, it only compares the two to "look for any discrepancies." There is no calculation of temperature difference between the sensors, either literally or by equivalency.

The Sundance unit operates in exactly the same manner as the Balboa control units which were available more than one year prior to the earliest filing date of the patent in suit. Either Claim 4 of the patent in suit is fully anticipated by the prior art for the same reasons as set forth regarding claim 1, or Sundance is simply following the prior art and cannot be held to infringe this claim. Claim 4 is invalid under either 35 USC §102 or 35 USC §103.

Claim 37 is directed to the freeze control feature of the system. As stated in the attached Buck testimony, and as shown in the attached SPATROL and Balboa deposition exhibits, both SPATROL and Balboa had freeze control. In these prior art devices as specifically called for in the claim, when the water temperature falls below a predetermined threshold value, the pump is activated to circulate the water and prevent the water from freezing. This is also what the Sundance device does. Claim 37 is either invalid under 35 USC §102 or 35 USC §103 in view of SPATROL and Balboa, or Sundance merely follows the teachings of the prior art and cannot now be held to infringe.

In summary, it is my opinion that each of claims 1, 2, 4 and 37, the only claims asserted by Plaintiff to be infringed by Defendant Clark, are invalid either under 35 USC §102 or 35 USC §103, or are so limited by the prior art that they cannot read on the Sundance controls.

The remainder of my report is rebuttal and that portion of my report will be filed on March 1, 1996. However, to eliminate any possible misconception of the scope of my

testimony, paragraph 6 of my report dated February 1, 1996 expresses my opinion that the claims of the patent in suit are not infringed either literally or under the doctrine of equivalents by the spa control units of Defendant Clark. I will only testify in this regard in order to rebut any testimony that Plaintiff may offer supporting a charge of infringement. Since only Claims 1, 2, 4 and 37 are being asserted, it is clear that my testimony will be limited to these claims. The doctrine of equivalents will be controlled by the development of the prior art as shown in my analysis of the invalidity of claims 1, 2, 4 and 37 under paragraph 5 of my report, as well as statements made by the applicants during prosecution of the various applications related to the patent in suit and the art before the examiners during the pendency of the applications. The related applications and record art are set forth in deposition exhibits 10-15. Due to the bulk of these exhibits, they are not attached to this supplemental report. Since this is rebuttal testimony, it is not possible at this time to specifically state what portions of these exhibits may be relied on to invoke prosecution history estoppel to limit the doctrine of equivalents. Plaintiff must first identify how it is relying on the doctrine to establish infringement. I am currently reviewing the Bennett report to determine the alleged basis for infringement of the only asserted claims 1, 2, 4 and 37 and will file my rebuttal on March 1, 1996.

With respect to paragraph 7 of my report, I will also rely on the related applications and record art in deposition exhibits 10-15 to demonstrate that material prior art was not disclosed to the Patent Office as required under 37 CFR 1.56, and further that inconsistent statements made during the prosecution show that the duty of candor was not met. It is my opinion that the failure to meet these obligations renders the patent unenforceable. I consider this a rebuttal position, which can only be established after it is established how the patent is to be interpreted and applied as asserted by Plaintiff. Specifically, I am now reviewing this aspect of Defendants' defense based on the assertion and interpretation of the only asserted claims 1, 2, 4 and 37 to determine if this issue is applicable to these claims. I will file my rebuttal report regarding this issue on March 1, 1996.

In paragraph 8 of my report dated February 1, 1996, I express the opinion that this is an exceptional case under 35 USC §285. This is largely a result of my conclusions based on my rebuttal position developed regarding paragraphs 6 and 7 of my report dated February 1, 1996. Since claims 1, 2, 4 and 37 are the only asserted claims, I will have to develop my opinion based on the allegations regarding the enforceability of only these claims. My report on this issue will be filed on March 1, 1996.

In paragraph 9, I indicate that I will testify generally regarding the limitations of trade secrets. This is intended to be a discussion regarding the scope of the asserted trade secrets and will only be used as rebuttal testimony after it is established what the Plaintiff regards as its trade secrets. Once this has been established I will review the earlier course of dealings by the Plaintiff in order to establish by rebuttal testimony that the Plaintiff is not entitled to trade secret protection. This rebuttal phase of my report will be filed on March 1, 1996.

Any testimony I may give regarding the proper basis and calculation of damages is rebuttal testimony. I am currently reviewing the damage expert report filed by Bettina Whyte of Price Waterhouse dated February 1, 1996 to determine the scope of my rebuttal. My report on this issue will be filed on March 1, 1996.

February 19, 1996
Date

Albert B. Kimball Jr.
Albert B. Kimball Jr.

M:\ip\clark\kimball.rpt



SPA-TROLLER

THE COMPUTERIZED SYSTEM



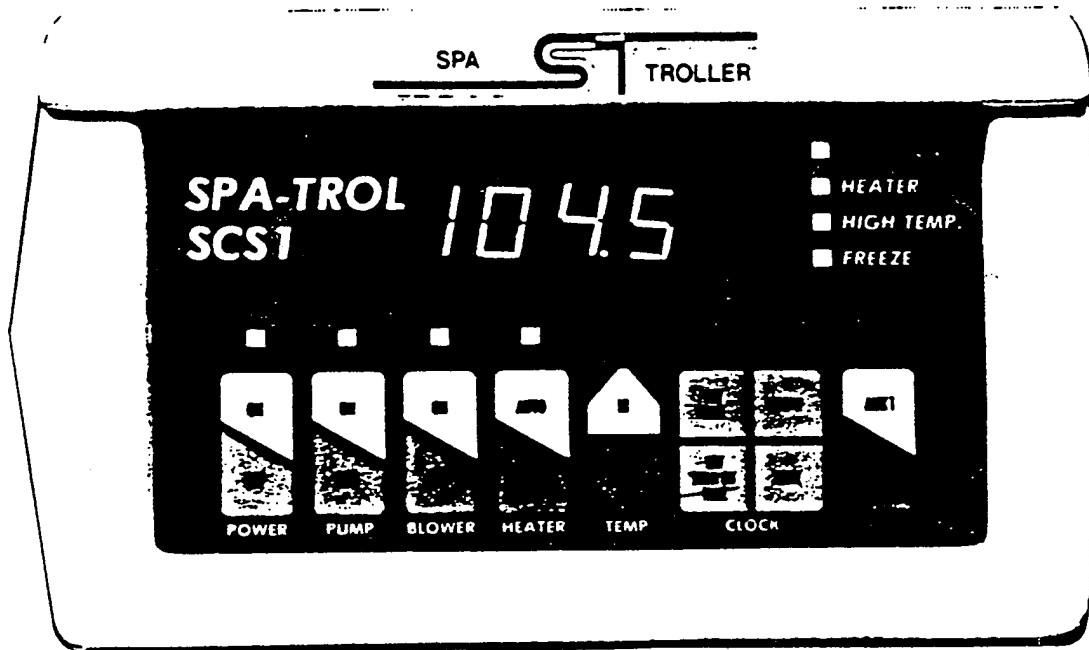
ATTACHMENT B

SPA-TROL

134-22

657

COMPLETE PROGRAMMING AND CONTROL FROM ONE CENTRAL COMPUTER



THE COMPUTERIZED SYSTEM

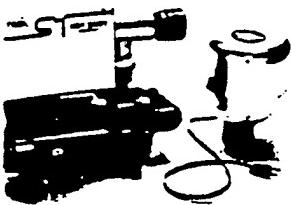
Imagine controlling all the functions of your spa from one central computer. A computer that activates any or all the functions of your spa when you desire.

Introducing Spa-Troller. A self-contained, micro-processing controller that is the heart and brains of our equipment packages. From the control panel of your Spa-Troller, you can control the operation of the jet pump and blower, read the time of day, check the present water temperature of your spa, adjust the desired temperature, and set the time of day that you wish the spa to filter and heat. You can also control up to two more functions such as a spa light, music, etc. Spa-Troller also has built in protection to prevent the water in your spa from freezing should the outside temperature become too cold.

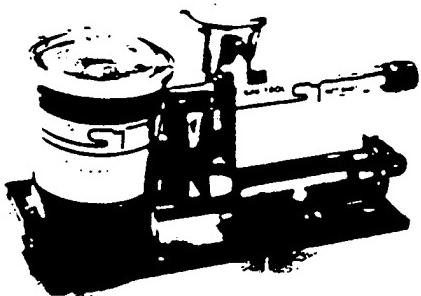
All the controls are self explanatory. The buttons are touch sensitive and when firmly depressed with the tip of the finger, an electric buzzer sounds and at the same time the corresponding function light lights up to indicate that it has been activated. What could be simpler or more convenient?

The Spa-Troller is now incorporated into all our models to further enhance and simplify the control of your spa. Among the other unique features of our equipment are: (1) The under-the-skirt gas heater, (2) Equalizer filter, (3) Copper heater housing, (4) Polished aluminum blower housing to insure rapid dissipation of heat, (5) Large digital read-out, (6) Indicator light if your spa is overheated, (7) Gas heater that uses only $\frac{1}{2}$ in. gas line such as a bar-b-que or fireplace, and (8) Complete control from the spa for your convenience.

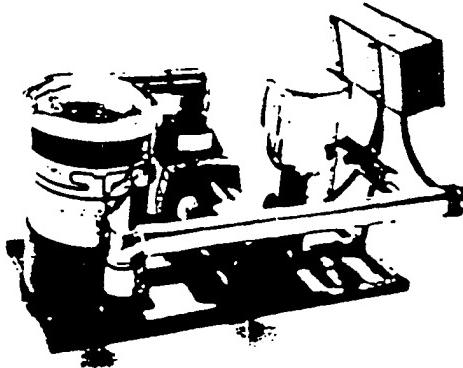
Fe
Avai
With



OEM CUSTOMS
With Spa-Troller



110 STANDARD
With Spa-Troller and
The Equalizer Filter



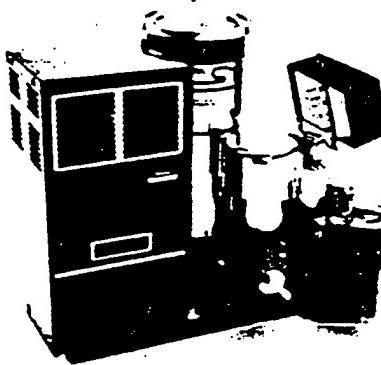
6KW or 11KW, 220
With Spa-Troller and
The Equalizer Filter



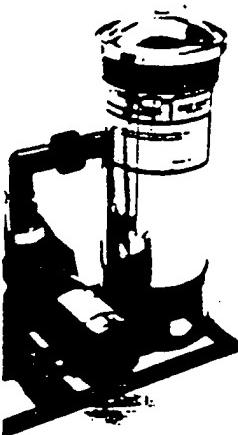
AS CONDO PACK
Rinnai Heater. Also
SUPER GAS PACK
& Pump. Contains
ter and Spa-Troller



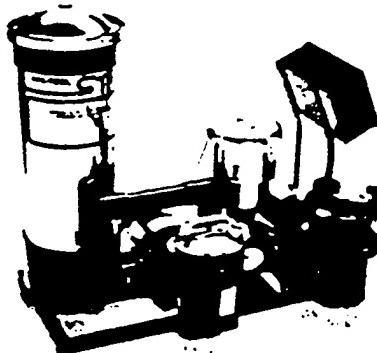
OEM 110V UNDERSKIRT GAS
PACK For Those Who Want The
Ultimate Efficiency, Economy and
Technology



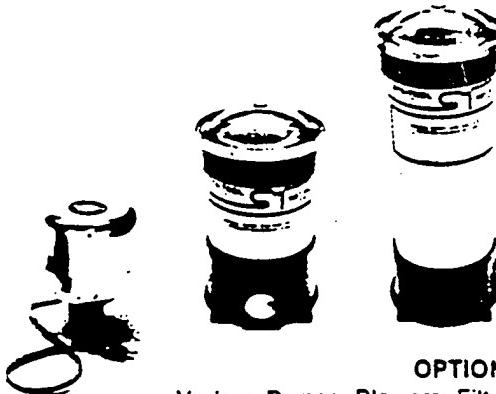
SUPER DUPER GA
With Power & Performance to
Satisfy the Most Discriminating



ADD-A-HEATER
Single Pump

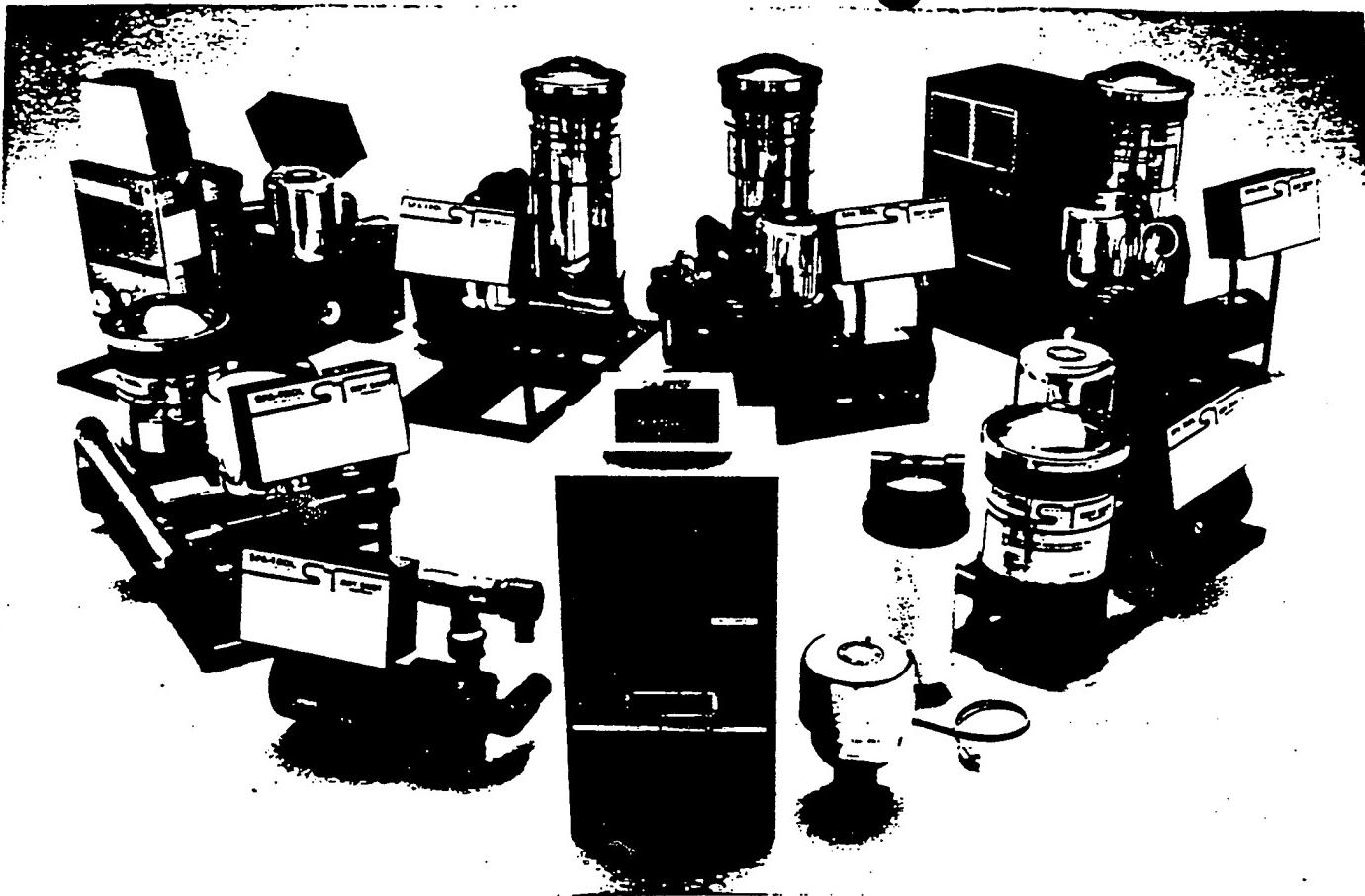


ADD-A-HEATER
Double Pump with Shot Gun Action



OPTION
Various Pumps, Blowers, Filters
are Available. Please Check with
Factory Representative

ST SPA-TROL



SPECIFICATIONS	OEM Customs	110 OEM	110 Standard	6 KW	11 KW	Condo Gas Pack	Super Gas	Under Skirt OEM Gas	Super Duper Gas (Box)	Condo With Booster	Add-a-Heater 1 Pump	Add-a-Heater 2 Pump
Jet Pump	½ HP 2 sp	½ HP 2 sp	½ HP 2 sp	½ HP 2 sp	1 HP 2 sp	½ HP 1 sp	1 HP* 1 sp	½ HP 1 sp	1½ HP* 1 sp	1½ HP 1 sp	1 HP* 1 sp	1½ HP* 1 sp
Circulating Pump	½ HP	NA	NA	NA	NA	½ HP	NA	½ HP				
Equalizer Filter	All	12.5 Sq. Ft.	25 Sq. Ft.	25 Sq. Ft.	25 Sq. Ft.	25 Sq. Ft.	50 Sq. Ft.	12.5 Sq. Ft.	50 Sq. Ft.	25 Sq. Ft.	50 Sq. Ft.	50 Sq. Ft.
Blower	All	6 Amp	6 Amp	1½ HP	1½ HP	1½ HP	1½ HP	1½ HP	1½ HP	1½ HP	1½ HP	1½ HP
Power	110V	110V	110V	220V	220V	110V	220V	110V	220V	220V	220V	220V
Time Clock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switches	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GFI	Yes	Yes	Yes	NA	NA	Optional	NA	Yes	NA	NA	NA	NA
Freeze Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Heater	1.5 KW	1.5 KW	1.5 KW	6 KW	11 KW	38,000 BTU	38,000 BTU	40,000 BTU Forced Draft	40,000 BTU Forced Draft	38,000 BTU	NA	NA

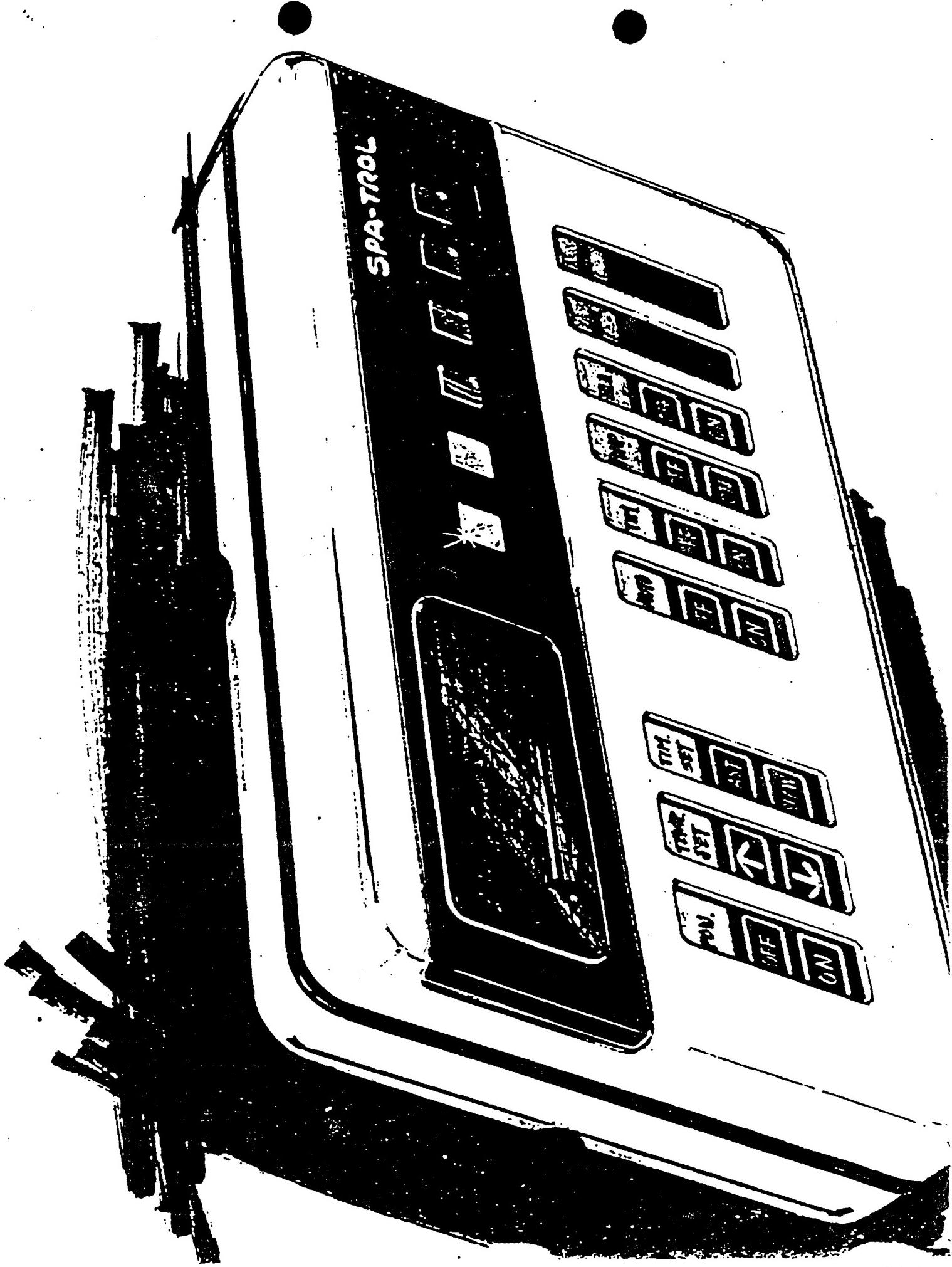
*Filter & pump size may vary at dealer.

Due to continual product improvement, we reserve the right to change materials, and specifications, at any time without notification.

Distributed by:

SPA-TROL ST

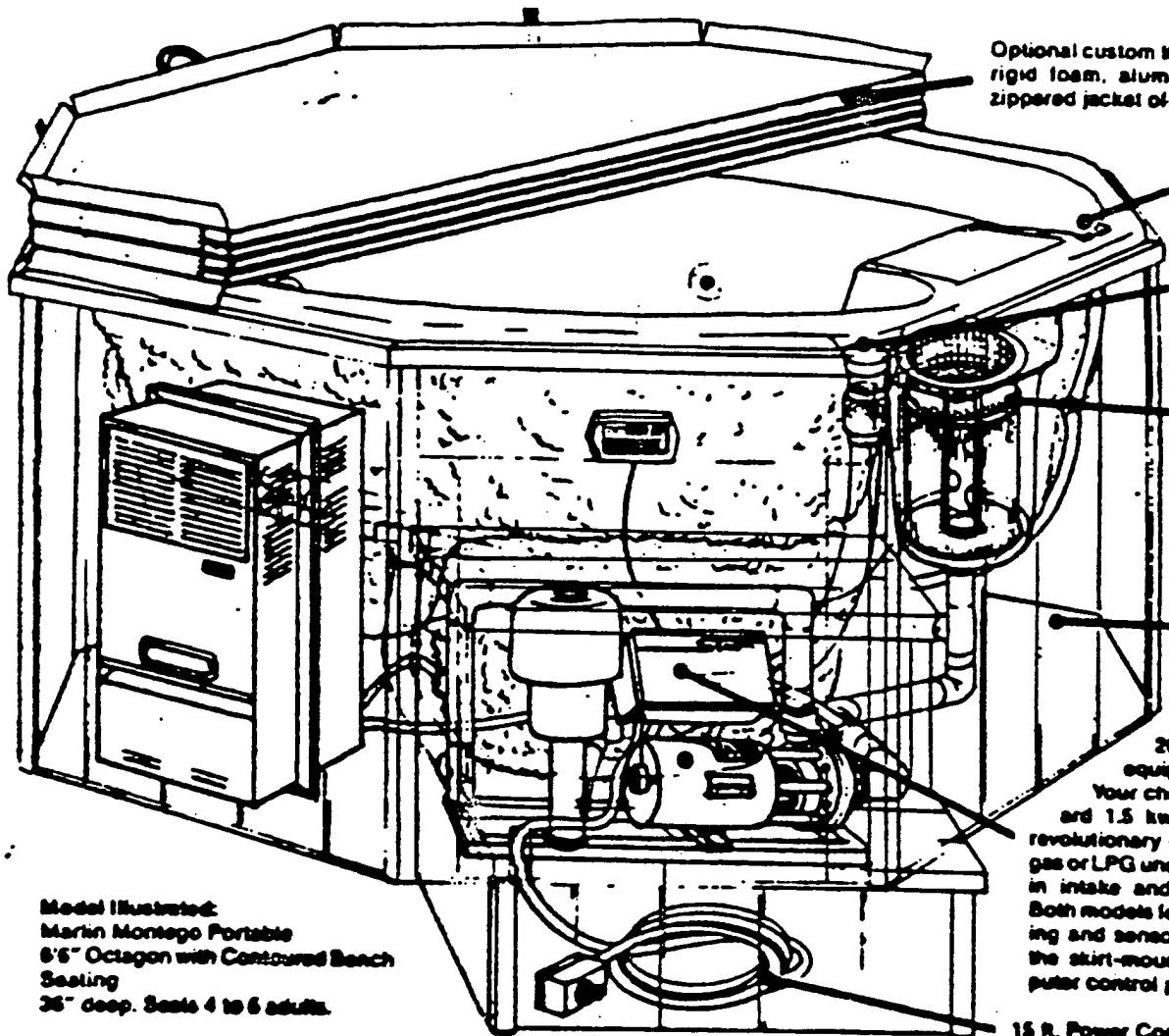
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AT LAST!

Introducing the Marlin Portables with Solid State Gas or Electric Equipment and Computer Controls
(It's About Time!)

IN FRONT OF INDUSTRY

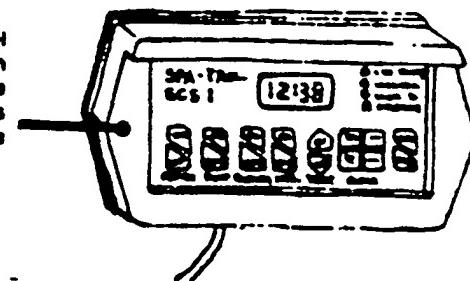


Model Illustrated:
Marlin Montego Portable
8'6" Octagon with Cornered Bench
Seating
26" deep. Seats 4 to 6 adults.



Something wonderful
to come home to.

The "Spa-Trol" computer control panel allows for 24 hr. programming of both heating and filtration as well as remote switching for all components. Its features include an L.E.D. time and temperature readout and automatic freeze control.



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134-27

662

1 have to have a drain for the control panel?

2 A Well, we -- we figured that if you had water
3 sitting there long enough it might seep in.

4 MR. HEIM: Let's mark the original as Exhibit 131 and
5 let's mark the one with the drain as Exhibit 132.

6 (Plaintiff's Exhibits 131 and 132 were
7 marked for identification by the deposition
8 officer and retained by counsel.)

9 THE DEPONENT: That's one of the originals too. This
10 was --

11 MR. HEIM: Hold on. You have to --

12 THE DEPONENT: -- the difference here.

13 MR. HEIM: She can't take down what you're saying
14 while you're --

15 132. Can you put that on the control please.

16 THE DEPONENT: The difference between those two is
17 about 10 grand.

18 Q BY MR. HEIM: In price?

19 A To put that notch into the mold.

20 Q Oh, it cost you 10 grand to change the molds?

21 A Right.

22 Q We have a third unit here that has --

23 A Same as 131.

24 Q -- a cable -- that's the same thing as 131?

25 A It has no notch.

1 features that you wanted to bring to the market through the
2 electronic control?

3 A There are some new features, but -- but nothing
4 we couldn't have done mechanically.

5 Q Tell me what some of the new features are.

6 A Well, the new features are that we could
7 program what temperature we wanted it to go to so that we
8 could touch a button and read that out, we could have set
9 that in mechanically and that would have been it.

10 We also had -- we had a temperature sensor that
11 gave us the temperature. Well, we could have gone down to
12 Radio Shack and for \$14 had a little thermometer that would
13 have done exactly the same thing, would have registered two
14 temperatures, that in the pool and that outside for \$14.
15 The time -- hell, any time clock would do what this does.

16 Q Anything else? Were there any other new --

17 A No.

18 Q That's it.

19 Let's talk about the temperature sensor for a
20 second. Where was the temperature sensor located in the
21 equipment pack?

22 A The temperature sensor is always, if its done
23 right, in the line generally between the pump and the
24 filter.

25 Q Okay.

1 A And the reason for that is you put it in the
2 line because that's the smallest body of water and if you
3 don't put it in the smallest body of water and you have a
4 cold climate -- if you put it in the tub for example, the
5 tub might never freeze but the line would.

6 Q Okay. So the sensor -- the temperature sensor
7 that was going to be installed in the Spa-Trol equipment
8 pack was put in the line, correct?

9 A Right.

10 Q And it was put in the line between the pump and
11 the filter?

12 A Oh, someplace in that area. I think --

13 Q Do you know where it was put?

14 A I'm not a mechanic, but it was put in the line,
15 let's put it that way.

16 Q Okay. Now, the -- the Spa-Trol unit did not
17 have a sensor that went into the spa tub, did it?

18 A No, ordinarily, no.

19 Q What do you mean, "ordinarily, no"?

20 A Well, some guys might put one in there, but
21 we -- we never put one in there. See, we didn't -- we
22 didn't install this thing.

23 We gave it to someone like Sundance and they
24 installed it and they might install it, you know, with
25 extra sensors or whatever.

1 Q What did you call the temperature sensor that
2 you put in the line, did it have a name?

3 A No.

4 Q Did you call it the high limit sensor?

5 A Oh, we had high limits, yes.

6 Q But that was something different than the
7 sensor that you had in the line?

8 A High limit, yes, is a -- is a sensor, it's
9 another sensor.

10 Q Okay. And that's actually a switch, isn't it?

11 A Not really, no. High limit is -- is -- has to
12 do with the heater.

13 Q Yes. And what it does is it switches on and
14 off the heater; is that right?

15 A It -- it's sort of a -- as I recognize it, it's
16 not -- it's like your smoke detector, it goes off when you
17 are too high.

18 Q When it senses smoke it goes off?

19 A Right. Well, in this case when it's
20 overheated.

21 Q And what it does is it turns off the heater?

22 A Right.

23 Q Okay. Did that high limit -- you said that was
24 called a high limit sensor?

25 A Right.

1 Q Did that high limit sensor have a signal that
2 went back to your control panel?

3 A Sure.

4 Q You think it did?

5 A I think so.

6 Q Let's talk about that.

7 A I'm a salesman, see.

8 Q Okay.

9 A I'm the marketing man of that company. If you
10 really are going to get into this area you should be
11 talking to Mr. Lyle, but --

12 Q And we will. We'll be talking to him this
13 afternoon.

14 A I know nothing really. All I know is -- in
15 fact, anyone would tell you that I pride myself on not
16 knowing what I was selling.

17 Q Okay. So what you're saying is you don't know
18 the signals that go to the control panel?

19 A I only know what I think I know and that's
20 really not very much.

21 Q Well, let me ask you this: Have you ever seen
22 this what I'll call an interface board?

23 A Sure, I've seen it.

24 Q Can you hold that up so the camera can see it?

25 A (Deponent complies.)

1 Q Would you hold that up, please.

2 A That is a micro controller. The whole thing is
3 a micro control.

4 Q The whole circuit board is a micro controller?

5 A Yeah.

6 Q Okay.

7 A And that controls this (indicating) which
8 controls something else.

9 Q Tell me -- tell me what the micro control --
10 what signals the micro controller sends out to control
11 these different components?

12 A It controls -- get my right glasses on.

13 It controls the power on and off, it controls
14 the pump on or off, it controls the blower on or off, it
15 controls the heater on or off, it controls the temperature
16 high or low, it controls the clock mechanism with a set
17 time and the set turn-on time and the adjustment of those,
18 it also controls the freeze control, it controls the
19 circulation pump, it controls high temperature, it controls
20 the auxiliary, whatever that would be a radio or whatever
21 and one and two.

22 Q My question was a little different than that.

23 My question was what signals go from the micro
24 controller back to what I call the interface board?

25 A I just quoted you.

ATTACHMENT D

EXHIBIT 141

ATTACHMENT E

PAGES 38-47, 49

ATTACHMENT F

EXHIBIT 159

Confidential

D

MINUTES OF MEETING WITH BALBOA INSTRUMENTS - DAVE KLINE

JULY 30, 1986

ATTENDEES: Ron Clark, Galvin Bartlett, Charlie Johnson,
P. J. Mayes, Dave Kline, Jim Clark

- I. Dave Kline demonstrated prototype 700 series
- II. Discussion on possible features for the 700 series
 - A. Presently, the 700 series contain all the features of the 600 series
 - B. Digital temperature display was agreed upon - to be reviewed before final production models are approved
 - C. Heavy-duty 220 control system was agreed upon, using a split-board concept
 - D. Ozone relay position will be provided
 - E. Thirty-second, power-off backup will be provided
 - F. Coded lock will be provided
 - G. Two-speed blower switching will be evaluated by Dave Kline
 - H. Hot-air blower will be evaluated by Dave Kline, including 110 and 220 models
 - I. P.H. indicator display to be evaluated by Dave Kline
 - J. Decided that approximately 10 prototypes should be manufactured for field testing as soon as possible
 1. On completion of prototype testing, a short production-run test will be required, consisting of approximately 200 systems. These systems are to be exactly like the final 700 series.
 - K. Anticipate that a minimum of 6 months should be spent field testing these 200 units
 - L. The 700 series is expected to be available for sale in large quantities by November, 1987
 - M. Charlie and Dave Kline will work together on the 700 series panel: size, shape, color, and layout
- III. A 603-220 only system should be developed immediately
 - A. Dave Kline will report back on feasibility of the project as soon as possible
 - B. A test series of approximately 100 units will be required for evaluation purposes before mass production approval can be given
- IV. Presently Charlie expects 40 percent of our production in 1987 to utilize this 220-only configuration, 30 percent to utilize the 602 control systems, and 30 percent to utilize a new, low-end control system

REF ID: A
012167
AUG 06 1986
709

AUG 06 1986

- V. Dave and Jim Clark will work independently towards development of a new, low-end control system to compete with the features and the cost of the currently popular air-switch systems
 - A. Some features discussed were 110-120 convertible time clocks, lights, manual low-speed operation for anti-freeze conditions, and UL listing
- VI. Selling 502 control systems to Brett
 - A. Approximate sales of 4,000 units in 1987
 - B. Charlie and Galvin will determine the market feasibility and practicality
 - C. Dave Kline will develop pricing
 - D. Galvin will notify Brett of our continued interest and consideration; Galvin will schedule a meeting for the week of August 4
- VII. Written bids will be provided to Brett only after Dave Kline, Ron, Galvin, and Charlie have approved the marketing program

012168

110

700 SERIES SPA CONTROL

FEATURES

LCD DIGITAL TEMPERATURE DISPLAY
LCD FUNCTION DISPLAY
SELECTABLE REAL TIME DISPLAY FOR 5 SECONDS
PRESS UP OR DOWN ARROW TO SET TEMPERATURE
MAX SET TEMPERATURE IS 104°F
2 FILTER CYCLES - 2 AM & 2 PM DEFAULT
2 HOURS EACH SETTABLE TO ANY TIME & DURATION
15 MINUTE TIME OUT ON JETS & BLOWER
PUMP ACTUATION: LOW SPEED, THEN HIGH SPEED
STANDARD/ECONOMY MODES
LOCK SYSTEM FROM FRONT PANEL
PANEL BACKLIT FOR NIGHT VISIBILITY
PANEL TOTALLY READABLE IN DAYLIGHT
EUROPEAN TIME & TEMPERATURE DISPLAY POSSIBLE

CONSTRUCTION

CALIBRATION NOT REQUIRED, ALL SENSORS INTERCHANGEABLE
INTEGRAL HIGH LIMIT
SINGLE PLUG FOR ALL SENSOR INPUTS
ALL LOGIC & CONTROL ON BOARD
PANEL RECEIVES DATA VIA SERIAL DATA LINK
PANEL FREQUENCY LESS THAN 15 KHz FCC MIN.
BOARD WILL WORK WITHOUT PANEL PLUGGED IN
PANEL CABLE JACKETED FOR DURABILITY
TERMINAL BLOCK IS 50 AMP
SWITCH SELECTABLE 120/240 LOGIC
LOWER CUST VERSION AVAILABLE

SAFETY

MICROCOMPUTER HAS INTERNAL FAULT SENSING (IE. FLOW SWITCH STUCK).
HIGH LIMIT CIRCUIT TOTALLY SEPARATE
DIAGNOSTIC ROUTINE WILL CHECK SENSOR INTEGRITY
INTERLOCK & HIGH LIMIT OPENS ALL CIRCUITS

012169

10:45 AM 1/21/97
711

PICKING SLIP E

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P

S SUNDANCE SPRS
O 10551 MONTE VISTA AVE.
D CHINO, CA 91710
T T
O

ENT	ITEM # / DESCRIPTION / SERIAL #	BN	UNITS	QUANTITY ORDERED	QUANTITY SHIPPED	QUANTITY BACKORDERED
001	30168 SYSTEM 200 COMPLETE/PN 85500-905	1	EA	2.0000	2.0000	
002	30167 PANEL 200 COMPLETE/PN 85500-905	1	EA	1.0000	1.0000	
003	30176 BOARD, 200 COMPLETE WITH SENSOR	1	EA	2.0000	2.0000	

RECEIVED
MAY 03 1989
ENGINEERING

5/3/89
Engineering

PRICING _____

RECEIVED BY _____

M.M. _____

DATE 5-3-89

ACCT. _____

S.O. # _____

D.E.'S EXHIBIT 114 for identificationDeponent: Tony SadatiDate: 12-11-95; Page 1 of 5

000942

COMPATIBLE ENVELOPES

713

DELIVERY RECEIPT

FROM

BALBOA INSTRUMENTS, INC.
1611 Bobcock Street
Newport Beach, CA 92663

VIA Balboa
DATE 4-5-89
DELIVERED TO Sundance

ITEM NO. _____
ITEM NO. _____

QUANTITY	NO.	DESCRIPTION
3	—	200 Systems modified modified with no filter jackets

000943

119

214

DELIVERY RECEIPT

FROM

BALBOA INSTRUMENTS, INC.
1611 Bobcock Street
Newport Beach, CA 92663

VIA Balboa
DATE 4-5-89
DELIVERED TO Sundance

ITEM NO. _____
ITEM NO. _____

QUANTITY	NO.	DESCRIPTION	ITEM NO.	QUANTITY	NO.	DESCRIPTION	ITEM NO.
3	—	ELUC Transducers for 200 sets	54400B				

RECEIVED
APR 05 1989
ENGINEERING

WEIGHT
NO. PACKAGES
RECEIVED BY GOOD ORDER BY
X Sundance

RECEIVED
APR 05 1989
ENGINEERING

WEIGHT
NO. PACKAGES
RECEIVED BY GOOD ORDER BY
X Sundance

FORM 1000 RAPIDFORMS, INC. BELLMAWR, N.J. 08021

FORM 1000 RAPIDFORMS, INC. BELLMAWR, N.J. 08021

DELIVERY RECEIPT

FROM

BALBOA INSTRUMENTS, INC.
1611 Babcock Street
Newport Beach, CA 92663

VIA Bellbox

DATE 3-31-88

ITEM NO. 53430 V

QUANTITY

DESCRIPTION

NO.

RECEIVED BY

ATTN: Engineering Dept

000944

WEIGHT

NO. PACKAGES

RECEIVED IN GOOD ORDER BY

X Dennis Hartlage

715

FORM 1010 RAPIDFORMS, INC. BELLMAUR, N.J. 07823

FORM 1010 RAPIDFORMS, INC. BELLMAUR, N.J. 07823

BALBOA INSTRUMENTS, INC.

1611 Babcock Street
Newport Beach, CA 92663

VIA Bellbox

DATE 3-30-88

ITEM NO. 53430 V

QUANTITY

DESCRIPTION

NO.

RECEIVED BY

ATTN: Engineering Dept

000944

WEIGHT

NO. PACKAGES

RECEIVED IN GOOD ORDER BY

X Dennis Hartlage

715

BALBOA INSTRUMENTS, INC.

1611 Babcock Street
Newport Beach, CA 92663

VIA Bellbox

DATE 3-30-88

ITEM NO. 53430 V

QUANTITY

DESCRIPTION

NO.

RECEIVED BY

ATTN: Engineering Dept

000944

WEIGHT

NO. PACKAGES

RECEIVED IN GOOD ORDER BY

X Dennis Hartlage

715

BALBOA INSTRUMENTS, INC.

1611 Babcock Street
Newport Beach, CA 92663

VIA Bellbox

DATE 3-30-88

ITEM NO. 53430 V

QUANTITY

DESCRIPTION

NO.

RECEIVED BY

ATTN: Engineering Dept

000944

WEIGHT

NO. PACKAGES

RECEIVED IN GOOD ORDER BY

X Dennis Hartlage

715

BALBOA INSTRUMENTS, INC.

1611 Babcock Street
Newport Beach, CA 92663

VIA Bellbox

DATE 3-30-88

ITEM NO. 53430 V

QUANTITY

DESCRIPTION

NO.

RECEIVED BY

ATTN: Engineering Dept

000944

WEIGHT

NO. PACKAGES

RECEIVED IN GOOD ORDER BY

X Dennis Hartlage

715

INVOICE

BALBOA INSTRUMENTS, INC.
 1607 BABCOCK STREET PH. 714-645-3201
 NEWPORT BEACH, CA 92663

PAGE 1 PAGE 1

SUND10
 SUNDANCE SPAS
 13951 MONTE VISTA AVENUE
 CHINO, CA 91710

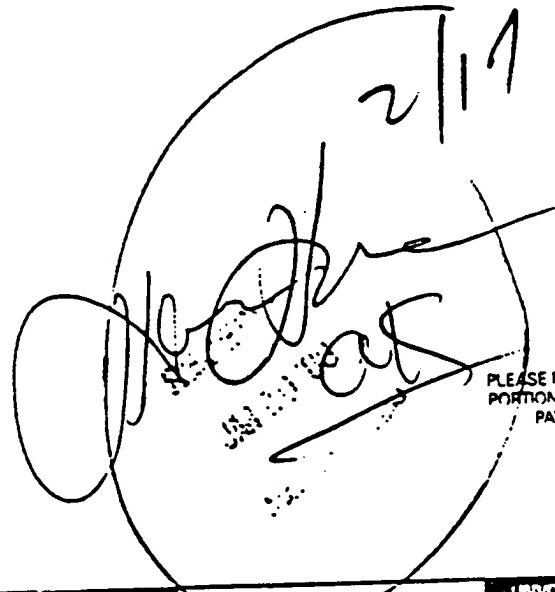
SUNDANCE SPAS
 13951 MONTE VISTA AVE.
 CHINO, CA 91710

SUNDANCE SPAS
 SUND10

ISSUED	ORDERING	SHIPPING DATE	SHIPPED VIA	TERMS	INVOICE NO.	DATE SHIPPED	PART NO.
01/12/88	52627M	01/12/88	BALBOA TRUCK	NET / 30	00102487	01/12/88	00102487

DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
-------------	----------	------	------------	--------

50168 SYSTEM 200 COMPLETE	Ordered Shipped	2.0000 EA	125.0000	250.00
50169 PANEL 200 COMPLETE	Ordered Shipped	2.0000 EA	25.0000	50.00
30131 MAGNET, INTERLOCK	Ordered Shipped	4.0000 EA	.5000	2.00

2/1/1

 PLEASE RETURN THIS
 PORTION WITH YOUR
 PAYMENT

NON TAXABLE	TAXABLE	SALES TAX	FREIGHT	MISC.	INVOICE TOTAL	INVOICE TOTAL
302.00	.00	.00	.00	.00	302.00	302.00

000945

71

114

216

DELIVERY RECEIPT

3939

FROM

BALBOA INSTRUMENTS, INC.
1811 Babcock Street
Newport Beach, CA 92663

VIA BalboaDATE 1-12-88 YOUR NO. 52627-m OUR NO.

DELIVERED TO

Sundance Spas.

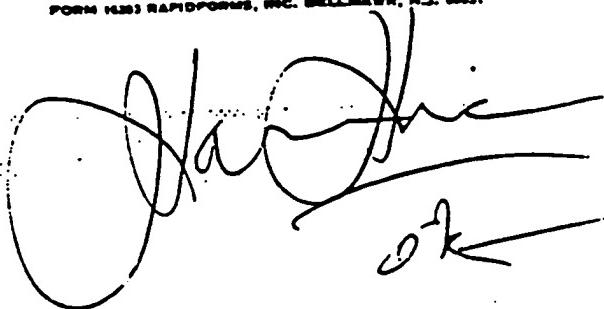
QUANTITY	NO.	DESCRIPTION
125F- 2	50168	System 200 therapy
25F- 2	50169	Panel 200
50 4	30131	Magnets

ATT: Engineering Dept
ATT: HASSAN

NO. PACKAGED	WEIGHT	RECEIVED IN GOOD ORDER BY
7A		x <u>Sharon Diamond</u>

FORM 1033 RAPIDFORMS, INC. BELLMAWR, N.J. 08031

000946



 114
 717

BALBOA INSTRUMENTS, INC.

1611 BABCOCK STREET
NEWPORT BEACH, CA 92663

(714) 645-3201

April 7, 1988

Mr. Shahin Moinian
Sundance Spas
13951 Monte Vista Ave.
Cerritos, CA 90710

Dear Shahin:

In response to your request, we have prepared a brief analysis of the Sea Tek control system as compared to the 700 control:

<u>Control Features</u>	<u>700 System</u>	<u>Spa Tek</u>
Temperature Display	LCD - 4 digit display.	Yes - Vacuum Fluorescent
Time Display	LCD Display.	Yes - Vacuum Fluorescent
Jets - High Speed	LCD Annunciator.	Yes - LED.
Jets - Low Speed	LCD Annunciator.	Not controllable from front panel.
Blower	LCD Annunciator.	Yes - LED.
Temp set from panel	LCD Annunciator.	Yes - LED.
Filter Cycle	2/day; any length.	1/day; max. 8 hrs.
Economy Selection	In conjunction with filter cycles.	Requires setting Start/Stop/Time & Temps.
Light, low voltage	2 Amps.	Amperage unknown.
Spa ready to use at set time	Yes - in conjunction with filter cycles.	Yes - Separate function.

PL/DEPT 48
EXHIBIT NO. _____ FDRP
DATE 17-8-93
WITNESS R- CLARK
PAGE 1 OF 4
DONNA S. BADGER, CSR NO. 8848

000961

48-1

719

700 System

Power Supply

120/240 convertible:
dedicated 240.

Display Mode

Continuously displays only
temp. of spa. Press either
arrow to see Set Temp.

Spa-Tek

120/240 convertible
only.

Safety Functions

Limited energy at
face of control
panel

Yes - less than 15V and
5 MA.

No. Multiple LED's
and Vacuum display
exceeds both values.

High Limit

Dual system: software
and hardware front
panel resettable.

~~Single switch in
heater. Must reset
at equipment pack.~~

Dry Fire Protection

Uses external flow
switch and software
monitor. Will not
start heater without
water. Monitors
condition of flow switch.
Will shut down system if
defective. Advises status.

Uses software monitor
only. Will start
heater without water

Interlock

Shuts off all external
functions and advises
status at front panel.

Shuts system down
completely.

Sensors

3 thermistors - will
monitor fur each if
disconnected and advise
at front panel.

2 thermistors - will
show error if
disconnected.

Circuit Breaker

2 ea - one for blower
and one for system per
UL 1563.

None.

GFCI

Yes.

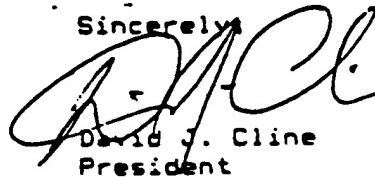
Yes.

<u>Pilot Lights</u>	<u>700 System</u>	<u>Spa Tek</u>
	2 ea for power and ground polarity.	No.
<u>Freeze Sensor</u>	Yes - separate sensor can be extended a long distance from spa.	Yes - can only operate within equipment pack. Doubles as dry fire protection.
<u>Impact Level</u>	Sharp object will not penetrate to display 3/16" lexan lens.	Membrane can be punctured by sharp object.
<u>Construction</u>		
Control of high power output lines	T90 relays with zero crossing actuation.	Triac with zero crossing actuation.
<u>Microcomputer Location</u>	On main board in aluminum enclosure. System will function normally without control panel.	In control panel. System disables completely if pane is disconnected.
<u>Panel Construction</u>	3/16" thick lexan faceplate with full potting, using special silicone gel. Injection molded, clear lexan 94V-0 lexan overlay. Potted electronics. Attached light box with Quick Change bulbs. Min. 50,000 hrs. of life.	.010 Lexan faceplate. No potting PVC with membrane overlay. Sealed.
<u>Switching Method</u>	Piezoelectric sensors - no air gaps.	Membrane switch w/ air gaps.
<u>External power supply hookup</u>	Integral junction box.	Requires extra junction box.

000963

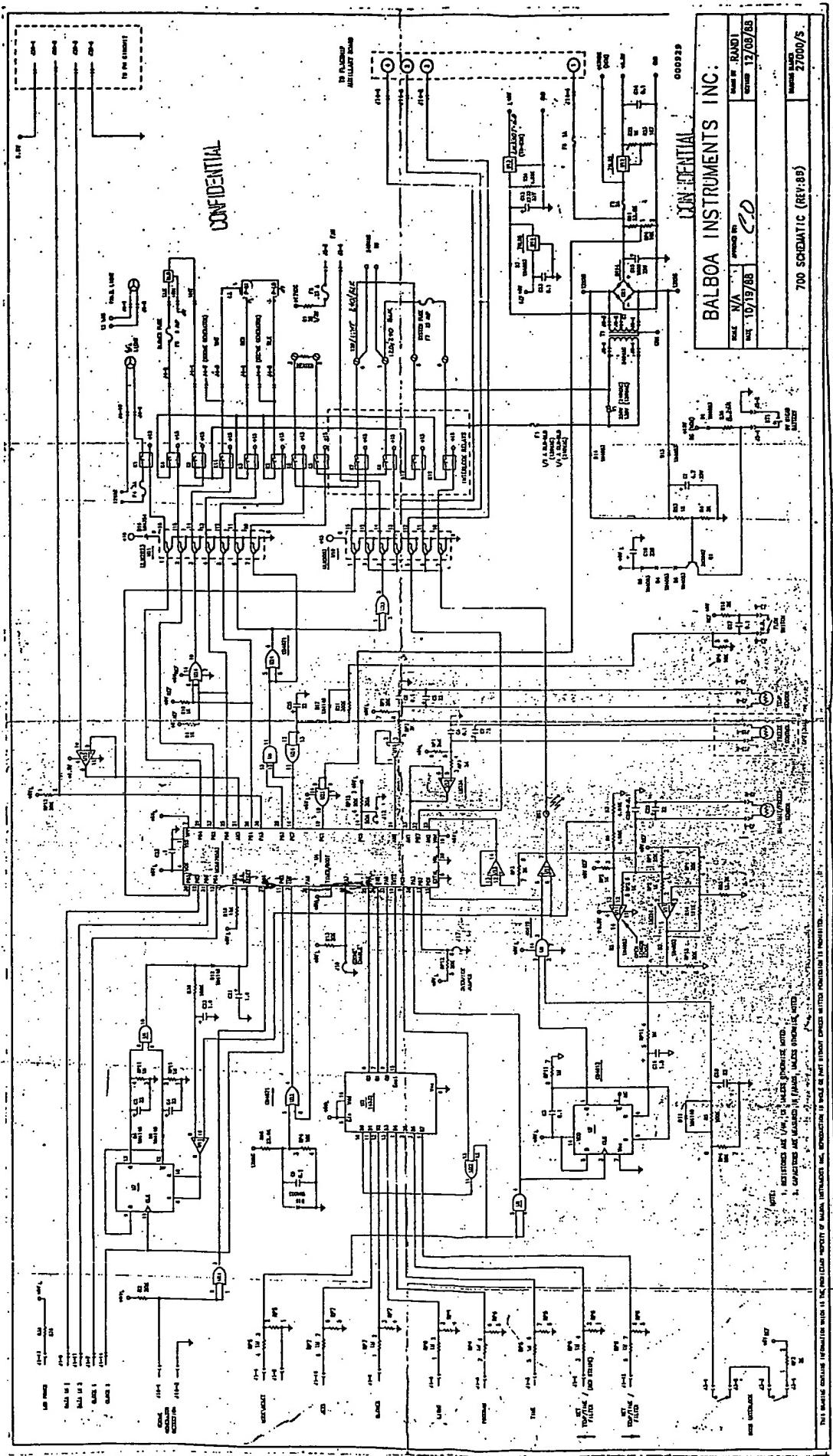
6

	<u>700 System</u>	<u>Spa Tek</u>
<u>Overlay Changeability</u>	Implement new design in 3 to 4 weeks.	Standard overlay.
<u>Electrical Parameters</u>	-----	-----
<u>Display Characteristics</u>		
	Liquid Crystal Display 4 digit alphanumeric. 9 symbolic annunciators. 15 word annunciators.	Vacuum fluorescent 4 digit alphanumeric 1 symbolic. 6 LED'S.
<u>Miscellaneous Features</u>		
Panel	One at spa. Accepts any combination up to 3 additional, either at spa or up to 100 feet remote.	One at spa only.
<u>pH Display</u>	Not in 1st production. Available in mid 1989. pH will automatically display when out of 7.2 - 7.6 range, alternates with temp.	Yes. <u>pH</u> alternates with temp and time continuously.
<u>2 Speed Blower</u>	Not in 1st production. Available in mid 1989.	No.
<u>Ozone Output</u>	Yes.	No.
<u>Temp. Set Back</u>	When in Economy mode, spa will maintain at 20 deg. below set temp.	No.

Sincerely,

David J. Cline
President

DJC/1h

000964



BALBOA
INSTRUMENTS
INCORPORATED

Phone 714.645.3201
FAX 714.645.3156

March 8, 1989

VERN

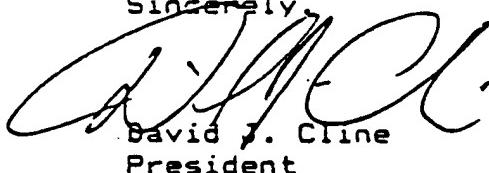
Doug Clark, Director
Manufacturing
Sundance Spas
13951 Monte Vista Ave.
Chino, CA 91710

Dear Doug:

Balboa Instruments, Inc. is pleased to provide the attached quote, effective April 1, 1989, for the 2nd quarter of Sundance Spas' 1989 control system production. Specifications are included for each system quoted.

1. Balboa Instruments, Inc. will provide all transportation to Sundance Spas, F.O.B. Chino, Freight prepaid.
2. Terms are net 30 days.
3. Shipments are scheduled on a "just in time" basis, and anticipate a quarterly release schedule on a 1 year blanket quantity purchase order.
4. Warranty is 1 year from date of installation at end-user site. Defective parts must be returned to Balboa Instruments, or such location as Balboa may designate, freight prepaid. Defective parts will be repaired or replaced at Balboa's sole discretion.
5. Out-of-warranty materials will be repaired regardless of condition, unless damage is such that they have been rendered unsafe. All shipping and handling is F.O.B. Chino, prepaid. Boards are remanufactured to "like new" condition.

Sincerely,



[Handwritten signature of David J. Cline]

David J. Cline
President

DJC/lh
Enclosures
cc: Monte Brancato

1611 Babcock
Newport Beach
California
92663

726
012170

Enclosure 1

March 8, 1989

1989 System Price List

<u>PN</u>	<u>Description</u>	<u>Qty</u>	<u>Price</u>
50168	200 Therapy System	250	206.22
	200 Therapy System	1,000	189.15
50169	200 Therapy Panel	250	38.74
	200 Therapy Panel	1,000	29.16
50175	605 E with Fuse & Holder	3,500	201.39
50170	605 Panel	3,500	42.44
50165	6XX Freeze & Flow	3,500	2.97
50724	724 System	5,000	216.26
50700	724 Panel	5,000	72.28
50724	701 System	5,000	216.26
50700	701 Panel	5,000	72.28
30131	Magnet	As required	.75
50179	6UR Spare board	As required	106.48
50162	624 Spare board	As required	133.16
50721	724 Spare board	As required	128.71
50176	200 Spare board	As required	75.00
-----	Board repair - Out of warranty	As required	35.00

012171

727

Enclosure 2

March 8, 1989

Specification of 605 System for 1989

Electric - Convertible 120/240, UL Recognized System

Functions controlled:

Temperature ± 1 deg F to UL 1563 spec.
Economy/standard mode
Light, 12.5V 2A
High speed pump
Blower
Heater (120V, 240V)
Low speed pump via thermostat, timeclock or
freeze sensor
Ozone generator on low speed pump
Filter cycle

Safety:

High limit logic input
Door interlock (2)
 Freeze sensor inout
G.F.I. protection
25A fuse
8A breaker
2 ea. Neon polarity lights
Flow switch input

Components:

Formed aluminum box, silver irridite coating with
splash guard
8 circuit 30A terminal block
605 board and necessary internal wiring
220V contactor
8 amp blower breaker
25 amp fuse & holder
2 ea. Neon polarity lights
G.F.I., 20A 120V
Timer, Diehl 24 hr. with clear lens
Temperature sensor
Freeze sensor wire, length to suit
2 ea. Interlock switches, 50" leads jacketed

High limit logic line, length to suit
605 lexan control panel and 605 lexan overlay to
Sundance specification with custom knob.
Pump wire, 4 conductor 14 Ga, length to suit
4 circuit 50A terminal block Flow switch wire,
length to suit
3 amp custom transformer
Bushings, strain reliefs, and hardware as needed
12 circuit 20A terminal strip with screw
connections
Blower hook-up assembly
G.F.I., 20A 120V (quoted as optional)
Ozone hook-up assembly
Conformal coating

Enclosure 3

March 8, 1989

Specification of 701 & 724 System for 1989

Electric - 240V UL Recognized System

Functions controlled from front panel:

Economy/standard selection
Filter cycle setting - 2 ea.
Time clock setting & display
Temperature to 1 deg. F
High speed pump
Low speed pump
Blower
Heater
Light
Panel lock
Ph display (optional, to be announced)
(Ozone option)

Safety:

Limited energy at control panel
✓ Dual high limit sensing software & hardware
✓ Freeze sensor
✓ Additional freeze sensor input position
Flow switch input
Software system fault monitor
25 Amp system fuse (branch circuit rated)
Appropriate blower fuse
2 ea. Neon polarity lights
3 Amp Light fuse
Appropriate control board fuse (non-replaceable)

Components

Formed aluminum box with integral supply hook-up
cooling channel with silver irridite plating.
724 control board & necessary internal wiring
Appropriate 5A blower fuse (replaceable)
25A System fuse (replaceable)
2 ea. Neon polarity lights
Matched isocurve dual temperature
sensor thermistors.
High limit/Freeze sensor
2 ea. Interlock switches, jacketed, length to suit
with magnets.
Lexan control panel with LCD display

8 piezo switches.
Back light for control panel
724 Overlay to Sundance specification
Pump wire 4 conductor, 14 GA, length to suit.
4 Circuit 50A field wiring terminal block
Flow switch wire, length to suit
3A Custom 120/240V transformer as appropriate
20 Amp terminal strip with screw connector
Blower hook-up assy.
Logic selection jumper 15A, 30A or 50A operation
Conformal coating to UL 1563 specification
Bushings, strain reliefs, and hardware to suit
Panel control loom jacket
Relay spacing to UL 1563 spec.
Custom 12V DC cooling fan
O'Ryan light socket assembly to Sundance spec.

United States District Court

CENTRAL

DISTRICT OF CALIFORNIA

SIEGE INDUSTRIES, INC.
V.
CLARK MANUFACTURING, INC., ET AL.

SUBPOENA IN A CIVIL CASE

CASE NUMBER: H94-3180
In the Southern District of Texas
Houston Division

TO: BALBOA CONTROLS c/o Joe Walker, The Walker Law Firm
1690 Scenic Avenue 1301 Dove Street, Suite 450
Costa Mesa, California 92626 Newport Beach, California 92660

YOU ARE COMMANDED to appear in the United States District Court at the place, date, and time specified below to testify in the above case.

COURTROOM

DATE AND TIME

YOU ARE COMMANDED to appear at the place, date, and time specified below to testify at the taking of a deposition in the above case.

PLACE OF DEPOSITION

Offices of The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

DATE AND TIME

Wednesday, January 17, 1996
9:00 a.m., and continuing
Thursday, January 18, 1996, if
necessary.

YOU ARE COMMANDED to produce and permit inspection and copying of the following documents or objects at the place, date, and time specified below (list documents or objects):

SEE EXHIBIT B to attached Notice of Deposition

PLACE

Offices of The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

DATE AND TIME

Wednesday, January 17, 1996
9:00 a.m.

YOU ARE COMMANDED to permit inspection of the following premises at the date and time specified below.

PREMISES

DATE AND TIME

Any organization not a party to this suit that is subpoenaed for the taking of a deposition shall designate one or more officers, directors, managing agents, or other persons who consent to testify on its behalf, and may set forth, for each person designated, the matters on which the person will testify. Federal Rules of Civil Procedure, 30(b)(6). The matters on which examination is requested are designated in EXHIBIT A to the attached Notice of Deposition.

ISSUING OFFICER'S SIGNATURE AND TITLE (INDICATE IF ATTORNEY FOR PLAINTIFF OR DEFENDANT)

T.S. Westby - att'y for Plaintiff

DATE

1-17-96

ISSUING OFFICER'S NAME, ADDRESS AND PHONE NUMBER

Timothy S. Westby, Conley, Rose & Tayon, Attorneys for Plaintiff, 1850 Texas Commerce Tower, 600 Travis,
Houston, Texas 77002 (713) 238-8000

Federal Rule of Civil Procedure, Part C, D on Reverse

PLH EXHIBIT 140 for identification
Deponent: Allan Pinkus
Date: 1-17-96; Page 1 of 8

PROOF OF SERVICE

SERVED	DATE	PLACE
SERVED ON (PRINT NAME)		MANNER OF SERVICE
SERVED BY (PRINT NAME)		TITLE

DECLARATION OF SERVER

I declare under penalty of perjury under the laws of the United States of America that the foregoing information contained in the Proof of Service is true and correct.

Executed on _____
DATE _____

SIGNATURE OF SERVER

ADDRESS OF SERVER

Rule 45, Federal Rules of Civil Procedure, Parts C & D:

(c) PROTECTION OF PERSONS SUBJECT TO SUBPOENAS.

(1) A party or an attorney responsible for the issuance and service of a subpoena shall take reasonable steps to avoid imposing undue burden or expense on a person subject to that subpoena. The court on behalf of which the subpoena was issued shall enforce this duty and impose upon the party or attorney in breach of this duty an appropriate sanction, which may include, but is not limited to, lost earnings and a reasonable attorney's fee.

(2)(A) A person commanded to produce and permit inspection and copying of designated books, papers, documents or tangible things, or inspection of premises need not appear in person at the place of production or inspection unless commanded to appear for deposition, hearing or trial.

(B) Subject to paragraph (d)(2) of this rule, a person commanded to produce and permit inspection and copying may, within 14 days after service of the subpoena or before the time specified for compliance if such time is less than 14 days after service, serve upon the party or attorney designated in the subpoena written objection to inspection or copying of any or all of the designated materials or of the premises. If objection is made, the party serving the subpoena shall not be entitled to inspect and copy the materials or inspect the premises except pursuant to an order of the court by which the subpoena was issued. If objection has been made, the party serving the subpoena may, upon notice to the person commanded to produce, move at any time for an order to compel the production. Such an order to compel production shall protect any person who is not a party or an officer of a party from significant expense resulting from the inspection and copying commanded.

(3)(A) On timely motion, the court by which a subpoena was issued shall quash or modify the subpoena if it

- (i) fails to allow reasonable time for compliance;
- (ii) requires a person who is not a party or an officer of a party to travel to a place more than 100 miles from the place where that person resides, is employed or regularly transacts business in person, except that, subject to the provisions of clause

(c)(3)(b)(iii) of this rule, such a person may in order to attend trial be commanded to travel from any such place within the state in which the trial is held, or

(iii) requires disclosure of privileged or other protected matter and no exception or waiver applies, or

(iv) subjects a person to undue burden.

(B) If a subpoena

(i) requires disclosure of a trade secret or other confidential research, development, or commercial information, or

(ii) requires disclosure of an unretained expert's opinion or information not describing specific events or occurrences in dispute and resulting from the expert's study made not at the request of any party, or

(iii) requires a person who is not a party or an officer of a party to incur substantial expense to travel more than 100 miles to attend trial, the court may, to protect a person subject to or affected by the subpoena, quash or modify the subpoena or, if the party in whose behalf the subpoena is issued shows a substantial need for the testimony or material that cannot be otherwise met without undue hardship and assures that the person to whom the subpoena is addressed will be reasonably compensated, the court may order appearance or production only upon specified conditions.

(d) DUTIES IN RESPONDING TO SUBPOENA.

(1) A person responding to a subpoena to produce documents shall produce them as they are kept in the usual course of business or shall organize and label them to correspond with the categories in the demand.

(2) When information subject to a subpoena is withheld on a claim that it is privileged or subject to protection as trial preparation materials, the claim shall be made expressly and shall be supported by a description of the nature of the documents, communications, or things not produced that is sufficient to enable the demanding party to contest the claim.

2/140

734

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

SIEGE INDUSTRIES, INC.,

Plaintiff,

v.

CLARK MANUFACTURING, INC.,
d/b/a SUNDANCE SPAS,
ROLAND CLARK, and
W. JAMES CLARK,

Defendants.

CIVIL ACTION NO.: H-94-3180

JURY TRIAL DEMANDED

**NOTICE *DUCES TECUM* OF 30(b)(6)
VIDEO DEPOSITION OF BALBOA INSTRUMENTS, INC.**

TO: Balboa Instruments, Inc., by and through its Attorney of Record:

Mr. Joe Walker, Esq.
The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

PLEASE TAKE NOTICE that Plaintiff Siege Industries, Inc. will take the deposition upon oral examination of the Balboa Controls, pursuant to Rule 30(b)(6) of the Federal Rules of Civil Procedure. The deposition will commence at 9:00 a.m. on Wednesday, January 17, 1996 at the offices of The Walker Law Firm, 1301 Dove Street, Suite 450, Newport Beach, California 92660 and will continue at 9:00 a.m. on Thursday, January 18, 1996 if necessary. The deposition will be taken before a notary public or some other person authorized by law to administer oaths pursuant to the Federal Rules of Civil Procedure.

The corporate deponent Balboa Controls ("CORPORATE DEONENT"), shall designate one or more officers, agents, or other persons who can testify on behalf of

3/140

735

CORPORATE DEPONENT with respect to all matters listed in EXHIBIT A attached hereto. You are invited to attend and cross examine. The deposition may be taken by stenographic as well as non-stenographic, i.e., videotape, means.

- Pursuant to Rule 45, the CORPORATE DEPONENT is requested to produce for inspection and copying the documents described in EXHIBIT B attached hereto. The term "documents" is used in the broad sense contemplated by Rule 34 of the Federal Rules of Civil Procedure.

DATED this 4th day of January, 1996.

By: Jeffrey Tayon / RSW
Jeffrey W. Tayon
State Bar No. 19749300
Texas Commerce Tower, Suite 1850
600 Travis Street
Houston, Texas 77002
(713) 238-8000 (Telephone)
(713) 238-8008 (Facsimile)

ATTORNEY-IN-CHARGE FOR
PLAINTIFF SIEGE INDUSTRIES, INC.

OF COUNSEL:

Michael F. Heim

SBN 09380923

Timothy S. Westby

SBN 00791904

CONLEY, ROSE & TAYON

Texas Commerce Tower

600 Travis, Suite 1850

Houston, Texas 77002

(713) 238-8000

(713) 238-8008 (Fax)

Stephen D. Susman

SBN 19521000

Eric J. Mayer

SBN 13274675

S. Grant Dorfman

SBN 00783976

SUSMAN GODFREY, L.L.P.

First Interstate Bank Plaza

1000 Louisiana, Suite 5100

Houston, Texas 77002

(713) 651-9366

(713) 653-7897 (Fax)

CERTIFICATE OF SERVICE

This is to certify that a true and correct copy of the foregoing *Notice Decus Tecum of 30(b)(6) Video Deposition of Balboa Instruments, Inc.* was served by certified mail, return receipt requested on all counsel of record, as follows:

Mr. Joe Walker, Esq.
The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

Mr. Louis B. Paine
Mr. Robert C. Curfiss
Ms. Marsha Z. Gerber
Butler & Binion
1000 Louisiana, Suite 1600
Houston, Texas 77002

on the 4th day of January, 1996.



EXHIBIT A to NOTICE DUCES TECUM of 30(b)(6)
VIDEO DEPOSITION of CORPORATE DEPONENT
BALBOA CONTROLS

Definitions and Instructions

- 1. The words "Defendant" and "Defendants" mean Clark Manufacturing, Inc., d/b/a Sundance Spas, Roland Clark, and/or W. James Clark as well as their counsel, and all of their agents, servants, employees, affiliates, subsidiaries, and representatives.
- 2. The phrase "spa controller" relates to any device for adjusting, affecting, calculating, calibrating, changing, controlling, formulating, maintaining, managing, manipulating, modifying, monitoring, programming, regulating, supervising, or varying system parameters and/or operations of a spa.

Topics

- 1. The design, development, and marketing of any programmable and/or microprocessor or microcontroller based spa controllers by Balboa, acting either alone or jointly with others, from 1985 through 1990.
- 2. The acquisition by Balboa of any Spa-Tec IMP spa controller(s), prototype(s), or any related information, from Defendants or others.
- 3. The reliability, failure rate, and modification of any microprocessor or microcontroller based spa controllers provided by Balboa to Defendants.
- 4. All agreements between Balboa and Defendants relating to design, development, or marketing of spa controllers.
- 5. All design changes to Balboa's microprocessor or microcontroller based spa controllers relating to the processing of signals from temperature sensors, including the number of temperature sensors, location of temperature sensors, connection to the control circuitry, and revision history.
- 6. All Balboa controller design change(s) relating to replacing a high limit switch with a high limit sensor providing a signal to a microprocessor or microcontroller.
- 7. The high limit algorithm(s) for Balboa spa controllers prior to October 15, 1990.
- 8. The freeze protection algorithm for Balboa spa controllers prior to October 15, 1990.

9. The role(s) and contribution(s) of any and all individuals involved in the design of temperature sensors for Balboa spa controllers, the connection of temperature sensors to spa controller boards, or high limit or temperature control algorithms.

10. All factors that lead to the development and adoption of microprocessor based controllers by the spa industry.

11. Any microprocessor or microcontroller based spa controllers designed prior to the introduction of the Balboa 700 series spa controller.

12. The development history of the Balboa 700 series spa controller.

EXHIBIT B to NOTICE DUCES TECUM of 30(b)(6)
VIDEO DEPOSITION of CORPORATE DEONENT
BALBOA CONTROLS

Documents

The CORPORATE DEONENT is requested pursuant to Rule 45 to produce for inspection and copying at the commencement of the deposition the following:

1. All documents relating to the infringement, validity, or enforceability of U.S. Patent No. 5,361,215.
2. All documents from 1985 to the present relating to the design, development, or marketing of any programmable and/or microprocessor or microcontroller based spa controllers by Balboa, acting either alone or jointly with others.
3. All communications between Balboa and any of Defendants related to reliability or failure of spa controllers designed or developed by Balboa, or provided to Defendants by Balboa.
4. All documents related to agreements between Balboa and Defendants relating to design, development, or marketing of spa controllers.
5. All documents relating to communications with Defendants or others related to Spa-Trol, Inc. or Spa-Troller spa controllers.
6. All documents relating to the development and testing of the Spa-Troller spa controller.
7. All documents relating to temperature sensors, including documents relating to the number, design, location, electrical connection, and revision history of temperature sensors.
8. All documents relating to the high limit, temperature control, or freeze protection algorithms for spa controllers prior to October 15, 1990.
9. All documents relating to the development and/or adoption of microprocessor based controllers by the spa industry.
10. All documents relating to Spa-Trol, Inc. or Baker-Hydro.
11. All documents or things that were provided to Steve Macey, Richard R. ("Dick") Palm, Sundance Spas, and/or Voyager Computer Corporation and that are related to or culminated in the development of the Sundance 800 series spa controller(s).

k\siege\00100\depo\balboa.net

IN-05-1996 11:07

FROM CONLEY ROSE & TAYON

TO

92373202 P.03

J

IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

SIEGE INDUSTRIES, INC.,

Plaintiff

S Civil Action No. H-94-3180

v.

CLARK MANUFACTURING, INC.,
d/b/a SUNDANCE SPAS, ROLAND
CLARK, and W. JAMES CLARK,

S JURY TRIAL DEMANDED

Defendants.

S

STIPULATED AMENDMENT TO AGREEDPROTECTIVE ORDER ENTERED MAY 2, 1995

1. An Agreed Protective Order was entered in the above entitled case on May 2, 1995 ("Order").
2. Balboa Instruments, Inc., a California Corporation, ("Balboa") which is not a party to this action, by and through its attorney of record, has approved the form and content of this amendment.
3. Plaintiff and the Defendants, by and through their attorneys of record, hereby stipulate to the contents of this amendment.
4. The Plaintiff and Defendants herein desire to depose representatives of Balboa and discover documents from Balboa.
5. Balboa desires to keep the information it discloses pursuant to subpoena in this action confidential.
6. Therefore, all information, both oral testimony and documentary, produced by Balboa in this action pursuant to subpoena shall be designated and treated as "Confidential" pursuant to the Order.

DRAFTED AND SERVED

1

PICKS EXHIBIT 29 for identification
Defendant: Allan Pinkul
Date: 1. 7. 96; Page 1 of 2

763

SENDER: BUTLER & BINION

: 5-96 : 1:55PM :

HOUSTON OFF

7520489; # 3 / 3

JAN-05-1996 11:08
JH - 4-30 AMU 10-21

FROM CONLEY ROSE & TAYON
WALKER LAW FIRM

TO IRVING C. SIEGAL
RECD BY IRVING C. SIEGAL

92373202 P.84

7. Pursuant to paragraph 3(iii) of the Order, Irving C. Siegal for the Plaintiff and Roland Clark for the Defendants, shall be the designated as the representative of the Plaintiff and Defendants, respectively, who shall be entitled to view Confidential information produced by BALBOA. Notwithstanding the language of paragraph 3, no additional officers, directors or employees of Plaintiff and Defendants shall be designated to review Confidential information produced by BALBOA.

8. For the purpose of affording the protections of the Order to BALBOA, BALBOA shall be included within the term "party" in the Order, where appropriate.

9. This Stipulated Amendment to Agreed Protective Order Entered May 2, 1995 may be enforced in the United States District Court for the central District of California or in the United States District Court for the Southern District of Texas, Houston Division.

D. Scott
of CONLEY, ROSE & TAYON, P.C.
For the Plaintiffs Sieg Industries, Inc.
by:

Date 1-5-95

Irvin Faine
of BUTLER & BINION, LLP
For the Defendants Clark Manufacturing, Inc.
Roland Clark and W. James Clark

Date 1-5-96

APPROVED AS TO FORM AND CONTENT.

John Walker
of THE WALKER LAW FIRM, APC
FOR Balboa Instruments, Inc.

Date 1/9/96

DWYER&AAP

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INTELLECTUAL PROPERTY LAW
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K
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Direct Dial No.
(713) 238-8030

February 7, 1996

Mr. Joe Walker, Esq.
The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

VIA TELECOPY
714-752-0439

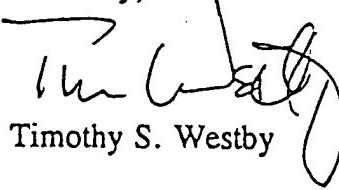
Re: *Siege Industries, Inc. v. Clark Manufacturing, Inc. et al.*
Civil Action No. H-94-3180 (S.D. Tex.)

Dear Mr. Walker:

We request that Balboa Instruments stipulate that we may disclose certain materials to the U.S. Patent & Trademark Office in connection with a pending patent application. The materials we intend to disclose to the U.S. Patent & Trademark Office include the exhibits and testimony from the January 17, 1996 deposition of Balboa (Allan Pinkul/Cindy Otto) that have been designated confidential by Balboa. The disclosure to the Patent Office will be made in accordance with § 724.02 of the Manual of Patent Examining Procedure (attached), which expressly allows for submission of Proprietary information and materials Subject to Protective Order. Please advise if you object to us providing this information to the Patent Examiner.

Moreover, many of the documents fall within the exclusions listed in paragraph 15(a) of the Protective Order in this case and, accordingly, should not have been designated confidential. As such, please be advised that Siege hereby challenges the propriety of Balboa's designation of the entire deposition testimony and exhibits as confidential, for the limited purpose of submitting these materials to the U.S. Patent & Trademark Office. This challenge is made pursuant to paragraph 11 of the Protective Order. If we do not hear from you within seven days, we will assume that Balboa does not object to our disclosing the Balboa deposition and exhibits to the U.S. Patent & Trademark Office pursuant to MPEP § 724.02.

Sincerely,


Timothy S. Westby

INTELLECTUAL PROPERTY LAW
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February 15, 1996

Mr. Joe Walker, Esq.
The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

VIA TELECOPY
714-752-0439

Re: *Siege Industries, Inc. v. Clark Manufacturing, Inc. et al.*
Civil Action No. H-94-3180 (S.D. Tex.)

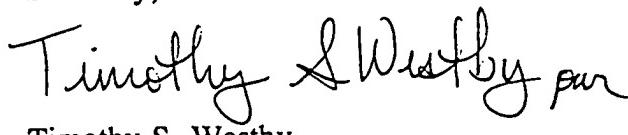
Dear Mr. Walker:

This is in response to your letter of February 14, 1996. Please note first, that Siege has no duty to specifically designate documents and particular exceptions to confidentiality under the Protective Order. Rather, Balboa had an affirmative duty under paragraph 15 *not* to designate certain types of documents as Confidential and, if challenged, a duty to substantiate the basis for such designation. Siege has properly challenged Balboa's designations. Second, notwithstanding the above, Siege did specifically identify the information involved, namely: the entire transcript of the January 17, 1996 Balboa deposition and all exhibits thereto. Accordingly, Balboa has not complied with the procedures set forth in paragraph 11 of the Protective Order, and Siege reserves the right to consider itself released from the restriction of the Order as to the information involved, all pursuant to paragraph 11.

Nevertheless, in the interest of resolving this matter in good faith on an informal basis, Siege offers to limit its request to disclose materials to the United States Patent & Trademark Office to: (1) documents dated prior to 1989, and (2) the deposition transcript. Further, while Siege does not feel there is any information in the transcript that justifies a Confidential designation, if you will identify specific portions of the transcript you believe are Confidential, Siege will consider redacting those portions in its submission to the United States Patent & Trademark Office. This proposal shall not be construed as a waiver of Siege's challenge to the confidentiality of the entire transcript and exhibits.

Because time is of the essence in this matter and Balboa's seven day period has expired, we request your response to the above by the close of business Friday, February 16, 1996. We will consider unreasonable delay a lack of good faith on Balboa's part in resolving this matter.

Sincerely,


Timothy S. Westby

Rebuttal Expert Witness Report

John K. Bennett

March 16, 1996

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Engagement

This report supplements my previous report, dated January 26, 1996, in the matter of Siege Industries, Inc. vs. Clark Manufacturing, Inc. (Civil Action H-94-3180), and offers rebuttal to certain positions taken by Defendants' Experts. I was retained by Conley, Rose & Tayon to prepare this rebuttal report.

Supplemental Information

Additions to "Publications Authored In Preceding Ten Years"

To the list of publications authored in the last ten years shown in Appendix A of my original report, the following paper has been accepted for publication:

- J.K. Bennett, Katherine E. Fletcher, and W. Evan Speight. The performance value of shared network caches in clustered multiprocessor workstations. To appear in *16th International Conference on Distributed Computing Systems (ICDCS-16)*, 1996,

and the following paper has been submitted for publication:

- W.E. Speight and J.K. Bennett. Hardware support for fine-grained sharing in shared-memory multiprocessors. Submitted to *Seventh International Conference on Architectural Support for Programming Languages and Operating Systems (ASPLOS)*, 1996.

Correction of Typographical Error

On Page 8, in the paragraph related to Claim 2 [b], second to last line, the phrase "... of said water downstream ..." should read "... of said water upstream ...".

Additional Materials Reviewed

In the course of preparing this rebuttal report, I have reviewed the following additional materials:

1. The "file wrapper" of U.S. Patent No. 5,361,215, "SPA Control System", dated Nov. 1, 1994, including all prior art placed before the patent examiner.
2. The Expert Report of Gavin Clarkson dated January 30, 1996, and his Supplemental Report dated March 1, 1996, including all attachments.
3. The Expert Report of Albert B. Kimball, Jr. dated February 1, 1996, and his Supplemental Report dated February 19, 1996, including all attachments.

4. All information provided by the parties related to the SPA-TROL SCS1, Baker Hydro, Eaton, and Balboa 700 spa controllers. In addition, I physically examined a SPA-TROL SCS1 control unit and associated relay card.

Rebuttal Report

Clarkson Report of January 30, 1996

Mr. Clarkson's initial report contains no statements relevant to the matters at issue in this action, therefore no rebuttal is appropriate or necessary.

Kimball Report of February 1, 1996

Mr. Kimball states in Paragraph 5 of his February 1, 1996 report:

"Based on my study and review outlined in this report, it is my opinion that the claims of U.S. Patent 5,361,215 are not valid in view of the prior art of either 35 USC § 102 or 35 USC § 103."

Since no prior art is cited in Mr. Kimball's February 1, 1996 report, and the "study and review" is not described, it is not possible to ascertain the origin or basis of Mr. Kimball's opinion as stated.

Mr. Kimball further states in Paragraph 6 of his February 1, 1996 report:

"Further in my opinion, the claims of U.S. Patent 5,361,215 are not infringed either literally or under the doctrine of equivalents by the spa control units of Defendant Clark Manufacturing, Inc."

Again, it is not possible to ascertain from Mr. Kimball's February 1, 1996 report either the origin or basis of the opinion stated.

Mr. Kimball further states in Paragraph 7 of his February 1, 1996 report:

"... I will give my opinion that this duty was not met in the patent applications leading to the issuance of U.S. Patent 5,361,215. For this reason, it is my opinion that this patent may also be unenforceable."

Once again, it is not possible to ascertain from Mr. Kimball's February 1, 1996 report either the origin or basis of the opinion stated.

Clarkson Supplemental Report of March 1, 1996

Paragraph 1

Mr. Clarkson argues in Paragraph 1 of his March 1, 1996 report that the Sundance spa controller cannot infringe because it is based on a "microprocessor", instead of a "microcomputer", as is referred to in U.S. Patent 5,361,215.

Mr. Clarkson's arguments on this issue are erroneous. Historically, a "computer" is a device that contains four essential elements:

1. an arithmetic / logic unit (ALU) that performs arithmetic and logical operations on data,
2. a memory for storing program code executed by the computer, as well as the data read and written by the program,
3. a means of input and output, and
4. a control unit that sequences the various operations of the computer.

Any device that embodies all of these elements is a computer. If the resulting computer is very large, it might be called a "mainframe" computer. If the resulting computer is of modest size, it might be called a "minicomputer". If the resulting computer is quite small, typically implemented on a single printed circuit board or integrated circuit, it might be called a "microcomputer". A "microprocessor" may or may not be a "microcomputer" as well, depending upon whether or not all of the four essential elements are present.

Sometimes a "microprocessor" will be called a "microcontroller" if the intended use of the device is to implement control functions. Like "microprocessors", a "microcontroller" may or may not also be a "microcomputer", again depending upon whether or not the essential four elements are present. The 80C562 used in the Sundance 800 spa controller (a block diagram of this device is attached as Appendix AA) is in fact correctly referred to as a "microcontroller", "microprocessor", or "microcomputer". The printed circuit board on which this device is mounted, together with its associated support devices is correctly referred to as either a "microcontroller" or a "microcomputer". Since these terms are often used somewhat interchangeably, it is best to examine the context in which they are used. U.S. Patent 5,361,215 describes what the term "microcomputer" means in the context of the description contained in the patent. The Sundance 800 spa controller clearly contains a "microcomputer" in this context.

Paragraph 2

Mr. Clarkson's arguments that attempt to distinguish between an "algorithm" and a "technique" are similarly flawed. If a "technique" describes a sequence of actions that solve a particular problem, then the "technique" is also an "algorithm". Again, because usage of these terms varies, even among professionals, it is best to examine the context in which the term in question is used. In this light, Mr. Clarkson's arguments on this issue lack merit.

Paragraph 3

Mr. Clarkson asserts that "there are no code similarities to be found". In fact there are similarities, which are described on Pages 11 and 12 of my report, and in Appendices J-O. Further, this issue is not particularly relevant, given that the Sundance 800 literally infringes Claim 37 of U.S. Patent 5,361,215 (the "Siege patent").

Paragraph 4

Based upon a description of the "COOL" and "ICE" panel indicators contained in the Sundance 800 Installation and Owner's Manual dated 6/94 (Exhibit C to Mr. Clarkson's March 1, 1996 report), Mr. Clarkson concludes that the Sundance 800 freeze protection algorithm is "fundamentally different" from the algorithm described in the Siege patent. Mr. Clarkson further concludes that "those procedures are identical to the 700 series, which was produced prior to 1990." Both of these conclusions are erroneous. Examination of the source code for the two controllers (attached as Appendices to my original report)

demonstrates the essential similarity of the two algorithms. Again, the essential element of the freeze protection algorithm that makes the Sundance implementation substantially similar to the Spa-Tec algorithm is the decision to turn on the heater if the pump alone is insufficient to increase the water temperature to a safe value. This feature is *not* present in the Balboa 700 series controller, as confirmed in the January 17, 1996 deposition testimony of Cindy Otto, excerpted below, beginning at Page 19, line 12).

Q: The - never turned on the heater?

A: No.

Q: Never looked at the temperature of the spa?

A: To turn on the freeze, no.

Q: Or to turn it off?

A: No.

Q: As of October 15, 1990, was the algorithm for the - was the freeze algorithm the same as you just described?

A: Yes.

Paragraph 5

It is interesting that Mr. Clarkson considers the Siege faceplate more similar to the SPA-TROL faceplate than the Sundance faceplate, given that the Sundance and Siege faceplates both use graphic icons, and the SPA-TROL faceplate does not.

Paragraph 6

Mr. Clarkson's asserts that my original report lacks specifics relative to the similarity of the two freeze protection algorithms. These specifics are provided on Pages 11 and 12 of the report, and in Appendices J, K, L, M, N, and O of the original report.

Kimball Supplemental Report of February 19, 1996

Mr. Kimball states on Page 1 "Now that it is established that Plaintiff is only asserting claims 1, 2, 4, and 37 as infringed...". Mr. Kimball apparently bases this belief on my report, in which I only discuss Claims 1, 2, 4, and 37. I have not been asked to form an opinion with respect to the other claims, nor am I aware of whether or not Plaintiff intends to assert other claims as infringed.

Paragraph 5 (supplemented)

Mr. Kimball asserts:

"It is my opinion that each of the asserted claims 1,2,3 and 37 is invalid as anticipated by the prior art under 35 USC § 102 or in the alternative is invalid as obvious in view of the prior art under 35 USC § 103."

and goes on to describe the basis of his opinion on a claim-by-claim basis. In each case, Mr. Kimball has either left out or mistated pertinent facts. I will address each of the points raised by Mr. Kimball in turn.

"I have reviewed the prior art spa control system identified as the SPATROL control, specifically the SPATROL SCS-1 computerized

system shown in Deposition Exhibits 134-22, 134-23, 134-24, 134-25, 134-27, (attachment B and physical Deposition Exhibits, 131 and 132, identified in the deposition Lloyd H. Buck (excerpts attachment C) at page 51, line 6. As stated by Mr. Buck in his deposition, at page 55, line 5 through page 58, line 3 and at page 61, line 9 through line 21, the SPATROL device meets each and every element of claim 1.

This evidence supports my conclusion and opinion that the spa control system set forth in claim 1 of the patent in suit is fully anticipated by the SPATROL SCS-1 control and that claim 1 is invalid under 35 USC § 102."

Mr. Kimball's analysis of the SPA-TROL SCS1 controller is incorrect. The SPA-TROL SCS1 does not contain "a second sensor for detecting the temperature of the water at said heating element" that is connected to a "microcomputer for processing signals generated by said sensors". Instead, the SPA-TROL SCS1 has a temperature switch that is not connected to the COP402 microcontroller located on the SPA-TROL SCS1 spa controller. This switch, if actuated by a high temperature condition, causes the circuit breaker supplying AC power to the spa and SPA-TROL SCS1 controller to trip, shutting down the entire system completely until manually reset. Appendix R (attached) contains a more detailed description of the operation of the SPA-TROL SCS1 controller.

It can be further argued that the COP402 microcontroller (a block diagram of this device is attached as Appendix BB) used in the SPA-TROL SCS1 controller lacks sufficient memory or processing capability to be considered a "microcomputer" (it contains only a 4-bit wide ALU, and only 256 bits of data memory), as envisioned in the Siege patent. This narrow data-path width and lack of data memory renders the COP402, and therefore the SPA-TROL SCS1 controller, incapable of performing the computations required to embody the sophisticated spa control described in the Siege patent.

Mr. Kimball's conclusions regarding the SPA-TROL SCS1 controller are therefore based upon an inaccurate set of underlying assumptions. Further, the testimony of Lloyd C. Buck relied upon by Mr. Kimball is not particularly reliable. As Mr. Buck states in his deposition (excerpted below, beginning at Page 58, line 1).

Q: Did that high limit sensor have a signal that went back to your control panel?

A: Sure.

Q: You think it did?

A: I think so.

Q: Let's talk about that.

A: I'm a salesman, see.

Q: Okay.

A: I'm the marketing man of the company. If you really are going to get into this area, you should be talking to Mr. Lyle, but -

Q: And we will. We will be talking to him this afternoon.

A: I know nothing really. All I know is - in fact, anyone would tell you that I pride myself on not knowing what I was selling.

"In any event, the SPATROL SCS-1 control operates in exactly the same manner as the Sundance control to perform exactly the same functions to accomplish exactly the same result as called for in claim 1. Therefore, even if the SPATROL control is found to anticipate claim 1 of the patent, the defendant's device could not be found to infringe since it is merely a copy of the prior art device."

As discussed above, the SPA-TROL SCS1 controller does *not* operate in "exactly the same manner as the Sundance control", any more than the SPA-TROL SCS1 controller operates in exactly the same manner as the Siege Spa-Tec Imp controller. While the Sundance 800 controller may be a copy of the Siege Spa-Tec Imp controller, it is *not* a copy of the SPA-TROL SCS1 controller.

"Additional prior art developed during the course of this litigation also fully anticipates claim 1 of the patent in suit. Deposition Exhibits 141 through 141-12 (attachment D) conclusively illustrate that the control system as claimed in claim 1 of the patent was previously invented by Mr. Allan Pinkul of Balboa Instruments Inc. before the earliest possible invention date of the patent in suit and was publicly disclosed to Sundance more than one year prior to the first application for patent. This is supported by the deposition testimony of Mr. Pinkul (excerpts attachment E), see page 38, line 20 through page 49, line 16."

It has not been demonstrated that the Balboa 700 device described by Mr. Pinkul in fact contains all of the elements of Claim 1 of the Siege patent. In addition, it is not clear when the Balboa 700 was actually reduced to practice. The earliest drawing of the Balboa 700 controller showing a microprocessor appears to be a sketch dated 2-6-86 (Deposition Exhibit 141, page 6) (attached as Appendix S), but the earliest possible confirmation of the existence of a functional unit appears to be the FCC certification signature of 8-25-87 (see Deposition Exhibit 153, Page 29) (attached as Appendix T). Furthermore, Claim 1 requires "a microcomputer for processing signals generated by said sensors, wherein said microcomputer selectively activates and deactivates said heating element". In order to demonstrate this element of Claim 1, the software source code that selectively activates and deactivates the heating element would have to be produced. However, the earliest copyright date to be found in the Series 700 software is 1990 (see Bates No. 008744) (attached as Appendix U). Additional documents referred to during the depositions of Mr. Pinkul and Ms. Otto appear to indicate that both the hardware and software of the Balboa 700 series controllers were in a state of flux at least until 1989, and perhaps into 1990. The Series 700 Service Manual (Deposition Exhibit 155), although undated, was written in 1989 or later, since it contains references to events that occurred in 1989 (see, for example, page 1-13, [Bates No. 007245], second paragraph: "... systems manufactured since 1989 ...") (attached as Appendix V). Pages 4 of Deposition Exhibit 154, dated 23-Aug-89 (attached as Appendix W) has the notation "These drawings are current, but not officially approved for release as of yet." Page 5 of Deposition Exhibit 154, originally dated 10/88, and changed to 3/20/89 (attached as Appendix X) indicates that hardware changes were still being made as of this date.

"In addition, the Eaton Spa Monitor II, available in 1983 as disclosed in Deposition Exhibit 159, 159-2 (attachment F) also fully discloses the device set forth in claim 1 of the patent."

This statement is in error. As the drawing on Page 2 of Deposition Exhibit 159 (attached as Appendix Y) clearly indicates, only a single temperature sensor is employed in the Eaton Spa Monitor II device. In addition, Deposition Exhibit 159 does not provide any evidence of reduction to practice or public use.

"It is my opinion that Claim 1 of the patent in suit is clearly invalid under 35 USC § 102 as anticipated by the SPATROL control, the Balboa Control and the Eaton Spa Monitor II"

Since the assumptions upon which Mr. Kimball bases this conclusion have been shown to be in error, this conclusion is also in error.

"Further, the state of the art as demonstrated by the work of Balboa, Spatrol and Eaton, clearly illustrates that the alleged invention set forth in the patent in suit would have been obvious to one of ordinary skill in the art at the time the alleged invention was made, making the invention obvious under 35 USC /S 103 and invalid."

At the time of the invention described in the Siege patent, I was a practicing designer of digital control systems, with higher-than-average training, skill, and experience. It is my opinion that the prior art available at that time does not render obvious the claims of the Siege patent. It is further my opinion that the original disclosure of the Siege patent would allow a person normally skilled in the art to build and use the invention described in the Siege patent.

"Claim 2 of the patent in suit identifies the location of the sensors in the device of claim 1. The Sundance location of sensors is precisely the same location as used in the SPATROL SCS-1, the Balboa device, and in all other known electro-mechanical devices as developed during the discovery phase of this litigation. This claim is fully anticipated under 35 USC § 102 for the same reasons set forth regarding Claim 1. In any event, the established state of the art based on the Balboa, Spatrol and Eaton efforts clearly establish that the invention as set forth in claim 2 was obvious under 35 USC § 103."

Since both the SPATROL SCS-1 and the Eaton Spa Monitor II only had a single temperature sensor, it is not possible for the location of the non-existent second temperature sensor to be the same as that of any controller system with two temperature sensors. Further, there has been no information provided that describes the precise location of the one temperature sensor in the SPATROL SCS-1 and the Eaton Spa Monitor II spa control systems. Furthermore, it has not been demonstrated that the Sundance 700 series spas using the Balboa controller have sensors located in the same place as the Sundance 800 spas. In addition, the previously discussed question of reduction to practice of the Balboa 700 controller applies to this claim as well.

"Claim 4 requires that the microprocessor calculates the difference between the temperatures detected by the sensors. First, it should be pointed out that the Richard Palm testimony relied on by Dr. Bennett does not support a finding that the Sundance control calculates the difference between the sensors. In fact, it only compares the two to "look for any discrepancies." There is no calculation of temperature difference between the sensors, either literally or by equivalency."

Claim 4 of the Siege patent does not specify the purpose for which the "microprocessor calculates the difference between the temperatures detected by the sensors". It simply claims a device in which such a difference is calculated. The Sundance 800 spa controller software in fact calculates this difference, and therefore infringes on Claim 4.

"The Sundance unit operates in exactly the same manner as the Balboa control units which were available more than one year prior to the earliest filing date of the patent in suit. Either Claim 4 of the patent in suit is fully anticipated by the prior art for the same reasons as set forth regarding claim 1, or Sundance is simply following the prior art and cannot be held to infringe this claim. Claim 4 is invalid under either 35 USC § 102 or 35 USC § 103."

The Balboa 700 controller did not perform this comparison until October of 1989, as indicated in the January 17, 1996 deposition testimony of Cindy Otto, excerpted below, beginning at Page 27, line 7).

Q: Do you remember when Balboa modified its 700 design to begin comparing the temperature probe input from the spa water and the Hi-Limit input?

A: 10/89.

This feature is also referred to as a "new software change" in Deposition Exhibit 163, dated August 9, 1990 (attached as Appendix Z).

"Claim 37 is directed to the freeze control feature of the system. As stated in the attached Buck testimony, and as shown in the attached SPATROL and Balboa deposition exhibits, both SPATROL and Balboa had freeze control. In these prior art devices as specifically called for in the claim, when the water temperature falls below a predetermined threshold value, the pump is activated to circulate the water and prevent the water from freezing. This is also what the Sundance device does. Claim 37 is either invalid under 35 USC § 102 and 35 USC § 103 in view of SPATROL and Balboa, or Sundance merely follows the teachings of the prior art and cannot now be held to infringe."

Mr. Kimball has failed to address the essential element that makes Claim 37 of the Siege patent unique, and which renders the Sundance controller infringing: *the decision to turn on the heater if the pump alone is insufficient to increase the water temperature to a safe value.* This feature is not present in the Balboa 700 series controller, as confirmed in the January 17, 1996 deposition testimony of Cindy Otto, excerpted below, beginning at Page 19, line 12).

Q: The – never turned on the heater?

A: No.

Q: Never looked at the temperature of the spa?

A: To turn on the freeze, no.

Q: Or to turn it off?

A: No.

Q: As of October 15, 1990, was the algorithm for the – was the freeze algorithm the same as you just described?

A: Yes.

This feature was also absent from the SPA-TROL SCS1 controller, as confirmed in the December 11, 1995 deposition testimony of Tony Sadati, excerpted below, beginning at Page 159, line 15).

Q: Did it turn on the heater when the temperature dropped below that threshold value?

A: I don't think so.

Q: It – so it may have turned on the pump?

A: Right.

Q: But it didn't turn on the heater?

A: No, I don't think so.

"In summary, it is my opinion that each of claims 1, 2, 4 and 37, the only claims asserted by Plaintiff to be infringed by Defendant Clark, are invalid either under 35 USC § 102 or 35 USC § 103, or are so limited by the prior art that they cannot read on the Sundance controls."

Again, faulty underlying assumptions lead to a faulty conclusion.

"With respect to paragraph 7 of my report, I will also rely on the related applications and record art in deposition exhibits 10-15 to demonstrate that material prior art was not disclosed to the Patent Office as required under 37 CFR 1.56, and further that inconsistent statements made during the prosecution show that the duty of candor was not met. It is my opinion that the failure to meet these obligations renders the patent unenforceable."

I have reviewed the prior art that was placed before the patent examiner for the Siege patent. In my opinion, the art that was not disclosed (in particular information related to the SPA-TROL SCS1 controller), is no more material or relevant than the art that was disclosed. In particular, the Burkett (No. 4,215,398), Pryor (No. 3,398,789), Gray (No. 4,406,550), and Eastep (No. 4,410,791) patents that were included in the prior art contain all of the elements present in the SPA-TROL SCS1 controller.

Date: 3/19/96

John K. Bennett
John K. Bennett

Description of Operation of the SPA-TROL SCS1 Spa Control System

John K. Bennett, PhD, PE

January 19, 1996

Background

The SPA-TROL SCS1 is a microcontroller-based Spa control system. This summary describes an overview of its operation based upon my review of the SPA-TROL SCS1 hardware. No written documentation was available, nor was the microcontroller software source code available for review. Further, no attempt was made to reverse-engineer the microcontroller source code by "disassembling" the code stored in EPROM. This review is based solely upon physical inspection of the actual hardware. This review was conducted at the request of Michael Heim and Timothy Westby of Conley, Rose, & Tayon of Houston, Texas.

Hardware Description

The SPA-TROL SCS1 system consists of two printed circuit cards: a Relay Card housed in a 6 inch by 10 inch metal enclosure locate near the AC power source, and a Console Card hermetically sealed into a plastic enclosure intended to be near the spa and convenient to the user. These two enclosures are connected by an unshielded plastic multi-conductor cable approximately nine feet in length. The Relay Card has four optically-isolated high-voltage relays for the heater, blower, and pump (pump low and high speed circuits have separate relays), an unregulated low-voltage DC power supply, a single temperature sensor input and associated analog calibration circuitry, a mode select switch (described below), terminal connections for a temperature high-limit switch, an output terminal to the GFI (ground fault interrupt) circuit breaker, and 3 octal connectors (two of which are designated for unspecified auxiliary equipment).

The Console Card assembly has a number of user-operated switches (Power On/Off, Pump On/Off, Blower On/Off, Heater On/Off, Temp Up/Down, Set Time, Set Turn-On Time, Pump Slow, Pump Fast, Aux 1 and Aux2), several indicator lights signifying either normal operation (Power On, Pump On, Blower On, Heater On), or a special condition (Circ Pump, Heater, High Temp, Freeze), an LCD display, a single analog to digital converter (connected via the Relay Card to the temperature sensor), a crystal-controlled clock, a 5 volt regulator, a 2758 1Kx8 EPROM (erasable, programmable read-only memory), and a National COP402 microcontroller and its associated support circuitry.

A block diagram of these two cards is shown on the attached figure. Most of the operational behavior of the SPA-TROL SCS1 is self-explanatory, but two aspects of controller operation require further explanation.

Temperature high-limit protection is provided by having a separate temperature switch, in addition to the temperature sensor that senses spa water temperature, that causes complete system shutdown when the high-limit temperature is reached. This shutdown is effected by tripping the main AC circuit breaker using its built-in GFI protection trip feature. The set-point of this high-limit shutdown is fixed, and is chosen by selecting a switch with a particular temperature value.

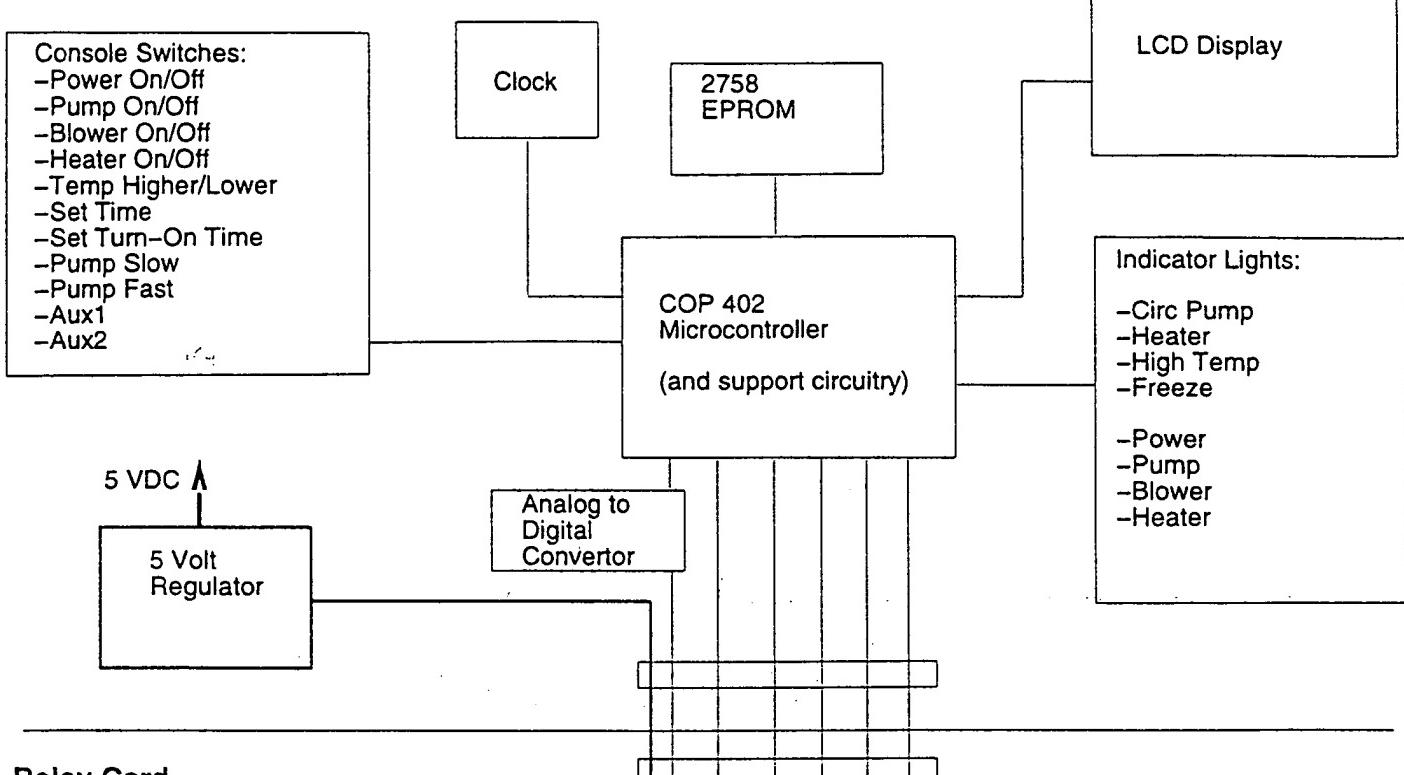
The "mode switch" on the Relay Card controls the behavior of the spa filtration cycle. There are three options, corresponding to the three switch positions:

Circulate Without Heat - Water is filtered daily at the selected "turn-on time". The heater does not operate.

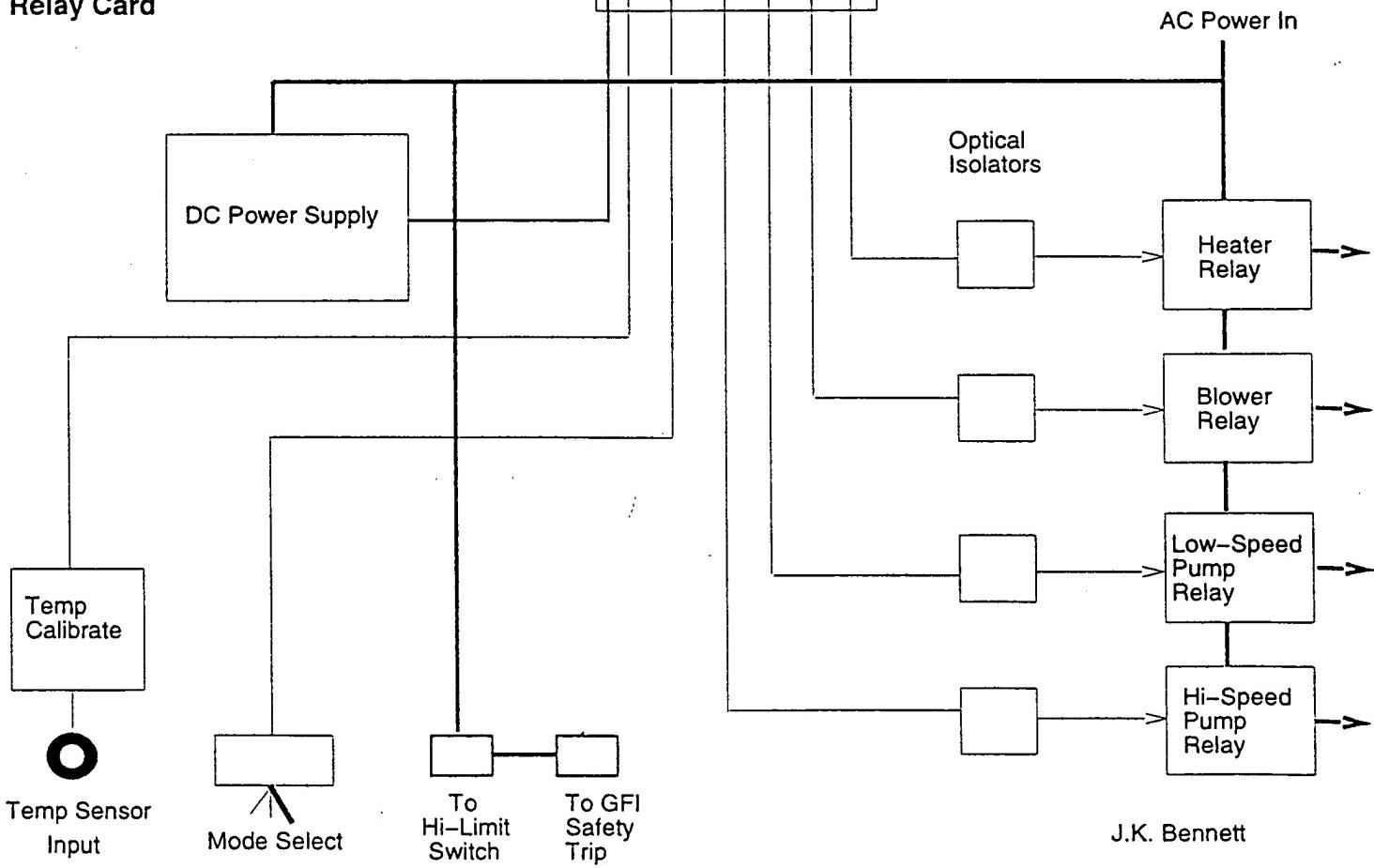
Circulate With Heat (normal operation) - Water is filtered daily at the selected "turn-on time". The heater is on during this period.

Off - Daily filtration is turned off and the console keypad switches are disabled. The unit continues to keep time.

Console Card



Relay Card



APPENDIX S

EXHIBIT 141

APPENDIX T

EXHIBIT 153

DB	1*HR_INC+HT_BIT	;	4
DFIL3:	DB	0	; FILTER MINUTE 1
	DB	0	2
	DB	0	3
	DB	0	4
	DB	5	; FILTER HOUR 1
	DB	6+PM_BIT	2
	DB	4	3
	DB	6+PM_BIT	4
	DB	1*HR_INC	; FILTER MODE 1
	DB	1*HR_INC	2
	DB	2*HR_INC+HT_BIT	3
	DB	2*HR_INC+HT_BIT	4

;
;
COPYRIGHT NOTICE
;

DB 'CLARK MANUFACTURING, INC 1990, 1991, 1992'
DB 'COPYRIGHT 1990, 91, 92'

END

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779

Sundance Spas Service Manual

G. F. I.'s are not required on "Hard Wired" spas; only those connected to house current by a plug-in cord. For safety, since shock hazard is eliminated on a properly connected hard-wired spa, Sundance recommends that even 120 volt spas be hard wired.



1.1.9.2 Circuit Breakers: Most systems are equipped with a system circuit breaker and a circuit breaker for the blower motor. 605 systems manufactured since 1989 and 724 systems use replaceable fuses. A system circuit breaker is shown in Figure 1-10.

1.1.9.3 Fuses: The power supply for the circuit board is built onto the board itself and fused to protect the circuitry. This fuse is shown in Figure 1-11. In addition, the spa light is fused on the model 624 & 724 spas.

1.1.9.4 Water Flow Detection: Both gas and electric heaters are designed to operate only when water is flowing through them in sufficient quantities to prevent boiling within the heater. Sundance spas are equipped with a pressure switch which senses water pressure in the heater. If for any reason, water pressure drops below the level required for safe operation of the heater, the pressure switch will cause power to be cut to the electric heater element, or the gas heater control module.

Gas heaters are equipped with their own pressure detecting switches in addition to the spa's flow switch. In gas heated spas, both switches must detect flow for the heater to operate.

1.1.9.5 Magnetic Door Interlocks: The door(s) which provide access to the equipment bay are equipped with magnetic switches. When the door(s) are opened, power is cut to the contacts of all relays, rendering the spa inoperative. Service personnel carry small magnets to keep the door switches closed for troubleshooting purposes. The door switch is shown in Figure 1-12.

1.1.9.6 High Limit Switches: Both gas and electrically heated spas are protected with a high limit switch. The switch is a temperature operated microswitch which opens at 118 degrees Fahrenheit. The high limit switch is in series with the magnetic door switch(es) and therefore has the same effect when it opens as they do.

If the high limit switch opens, it cannot be reset until the spa temperature drops to 110 degrees. At that point the manual reset button becomes operative. Except in 601 spas, the high limit switch will not reset automatically.

In the Model 724 spa, the "High Limit Switch" has been replaced with a high limit/freeze sensor. This sensor, like all spa conditions, is monitored electronically every three seconds. Should a high-limit condition be sensed, the 724 control logic shuts down all spa functions. The control logic continues to

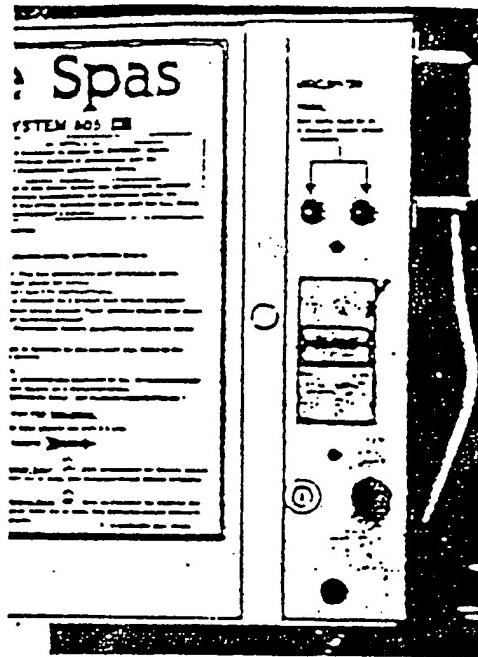


Fig 1-9 Ground Fault Interrupter

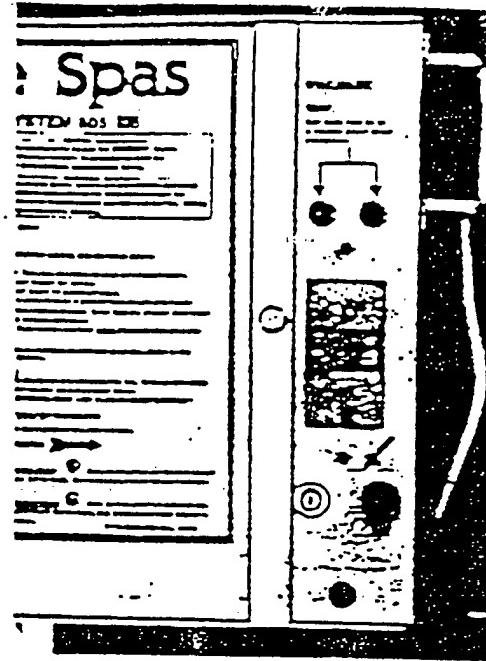


Fig 1-10 System Circuit Breaker/Fuse

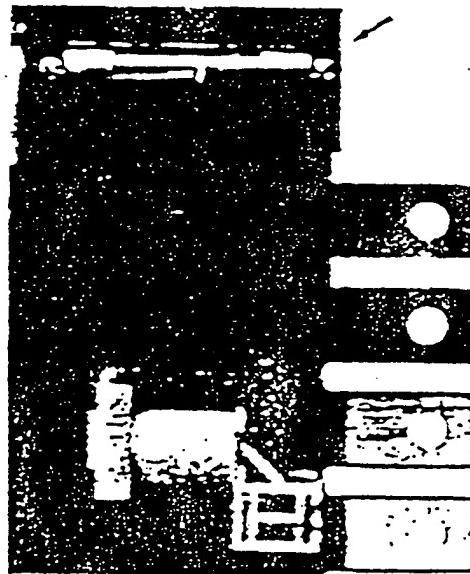


Fig 1-11 Logic Power Supply Fuse



Fig 1-12 Magnetic Door Switch

APPENDIX W
EXHIBIT 154

APPENDIX X
EXHIBIT 154

APPENDIX Z
EXHIBIT 163

Signetics Microcontroller Products

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Single-chip 8-bit microcontroller

80C562/83C562

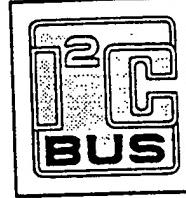
Single-chip 8-bit microcontroller with 8-bit A/D, capture/compare timer, high-speed outputs, PWM

DESCRIPTION

The 80C562/83C562 (hereafter generically referred to as 8XC562) Single-Chip 8-Bit Microcontroller is manufactured in an advanced CMOS process and is a derivative of the 80C51 microcontroller family. The 83C562/83C562 has the same instruction set as the 80C51.

The 8XC562 contains a non-volatile 256 x 8 read-only program memory, a volatile 256 x 8 read/write data memory (83C562) (the 80C562 is ROMless), a volatile 256 x 8 read/write data memory, six 8-bit I/O ports, two 16-bit timer/event counters (identical to the timers of the 80C51), an additional 16-bit timer coupled to capture and compare latches, a 15-source, two-priority-level, nested interrupt structure, an 8-input ADC, two pulse width modulated outputs, standard 80C51 UART, a "watchdog" timer and on-chip oscillator and timing circuits. For systems that require extra capability, the 83C562 can be expanded using standard TTL compatible memories and logic.

The device also functions as an arithmetic processor having facilities for both binary and BCD arithmetic plus bit-handling capabilities. The instruction set consists of over 100 instructions: 49 one-byte, 45 two-byte and 17 three-byte. With a 12MHz crystal, 58% of the instructions are executed in 1 μ s and 40% in 2 μ s. Multiply and divide instructions require 4 μ s.



FEATURES

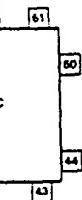
- 80C51 instruction set
- 8k x 8 ROM expandable externally to 64k bytes
- 256 x 8 RAM, expandable externally to 64k bytes
- Two standard 16-bit timer/counters
- An additional 16-bit timer/counter coupled to four capture registers and three compare registers
- Capable of producing eight synchronized, timed outputs
- An 8-bit ADC with eight multiplexed analog inputs
- Two 8-bit resolution, pulse width modulated outputs
- Five 8-bit I/O ports plus one 8-bit input port shared with analog inputs
- Full-duplex UART compatible with the standard 80C51
- On-chip watchdog timer
- Three temperature ranges
 - 0 to +70°C
 - -40 to +85°C
 - -40 to +125°C

PIN CONFIGURATION

Pin	Function	Pin	Function
1	P5.0/A0CO	35	XTAL1
2	V _{SS}	36	V _{SS}
3	STADC	37	V _{SS}
4	PWRD	38	NC
5	PWM1	39	P2.0/A0S
6	EW	40	P2.1/A0S
7	P4.0/CMRS0	41	P2.2/A10
8	P4.1/CMRS1	42	P2.3/A11
9	P4.2/CMRS2	43	P2.4/A12
10	P4.3/CMRS3	44	P2.5/A13
11	P4.4/CMRS4	45	P2.6/A14
12	P4.5/CMRS5	46	P2.7/A15
13	P4.6/CMTO	47	PSEN
14	P4.7/CMTI	48	ALE
15	RST	49	EX
16	P1.0/CTD1	50	P0.7/A07
17	P1.1/CT11	51	P0.6/A08
18	P1.2/CT21	52	P0.5/A09
19	P1.3/CT31	53	P0.4/A04
20	P1.4/T2	54	P0.3/A03
21	P1.5/RT2	55	P0.2/A02
22	P1.6	56	P0.1/A01
23	P1.7	57	P0.0/A00
24	P3.0/RxD	58	AVref+
25	P3.1/TxD	59	AVref-
26	P3.2/MTO	60	AV _{ss}
27	P3.3/RTT	61	AV _{ss}
28	P3.4/TD	62	P5.7/A0C7
29	P3.5/T1	63	P5.6/A0C3
30	P3.6/RT	64	P5.5/A0C3
31	P3.7/TD	65	P5.4/A0C4
32	NC	66	P5.3/A0C2
33	NC	67	P5.2/A0C2
34	XTAL2	68	P5.1/A0C1

562/83C562

TION



Pin	Function
35	XTAL1
36	V _{DD}
37	V _{SS}
38	NC
39	P2.0/A08
40	P2.1/A09
41	P2.2/A10
42	P2.3/A11
43	P2.4/A12
44	P2.5/A13
45	P2.6/A14
46	P2.7/A15
47	PSEN
48	ALE
49	EA
50	P0.7/AD7
51	P0.8/AD6
52	P0.9/AD5
53	P0.4/AD4
54	P0.3/AD3
55	P0.2/AD2
56	P0.1/AD1
57	P0.0/AD0
58	AV _{REF} -
59	AV _{REF} +
60	AV _{in}
61	AV _{in}
62	AV _{in}
63	P5.7/ADC7
64	P5.8/ADC6
65	P5.9/ADC5
66	P5.4/ADC4
67	P5.3/ADC3
68	P5.2/ADC2
69	P5.1/ADC1

Single-chip 8-bit microcontroller

80C562/83C562

UIC 23 1992

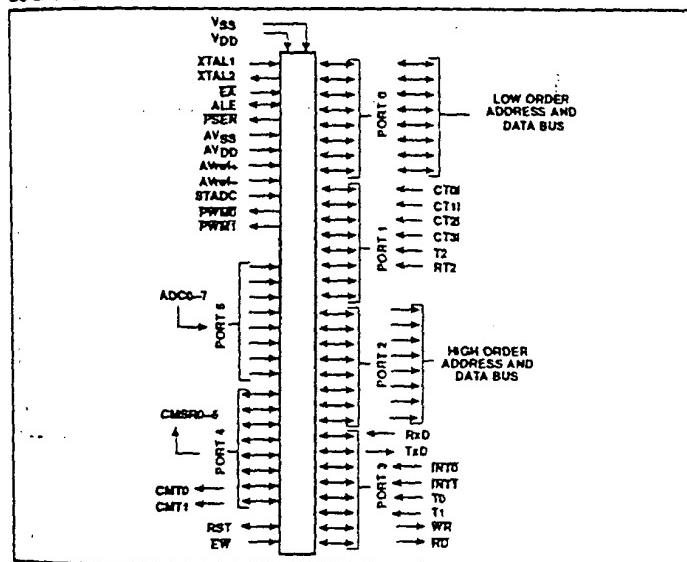
PART NUMBER SELECTION

PHILIPS PART ORDER NUMBER PART MARKING		SIGNETICS PART ORDER NUMBER		EPROM	TEMPERATURE °C AND PACKAGE	FREQ.
ROMless	ROM	ROMless	ROM			
PCB80C562-16WP	PCB83C562-16WP/xxx	S80C562-4A68	S83C562-4A68	S87C552-4A68 ²	0 to +70, plastic PLCC	16MHz
				S87C552-4K68 ²	0 to +70, ceramic CLCC with window	16MHz
PCF80C562-12WP	PCF83C562-12WP/xxx	S80C562-2A68	S83C562-2A68	S87C552-5A68 ²	-40 to +85, plastic PLCC	12MHz
				S87C552-5K68 ²	-40 to +85, ceramic CLCC with window	12MHz
PCA80C562-12WP	PCA83C562-12WP/xxx	S80C562-6A68	S83C562-6A68		-40 to +125, plastic PLCC	12MHz

NOTES:

1. 80C562 and 83C562 frequency range is 1.2MHz-12MHz or 1.2MHz-16MHz.
2. 87C552 frequency range is 3.5MHz-16MHz. For full specification, see the 80C552/83C552/87C552 data sheet.
3. xxx denotes the ROM code number.

LOGIC SYMBOL

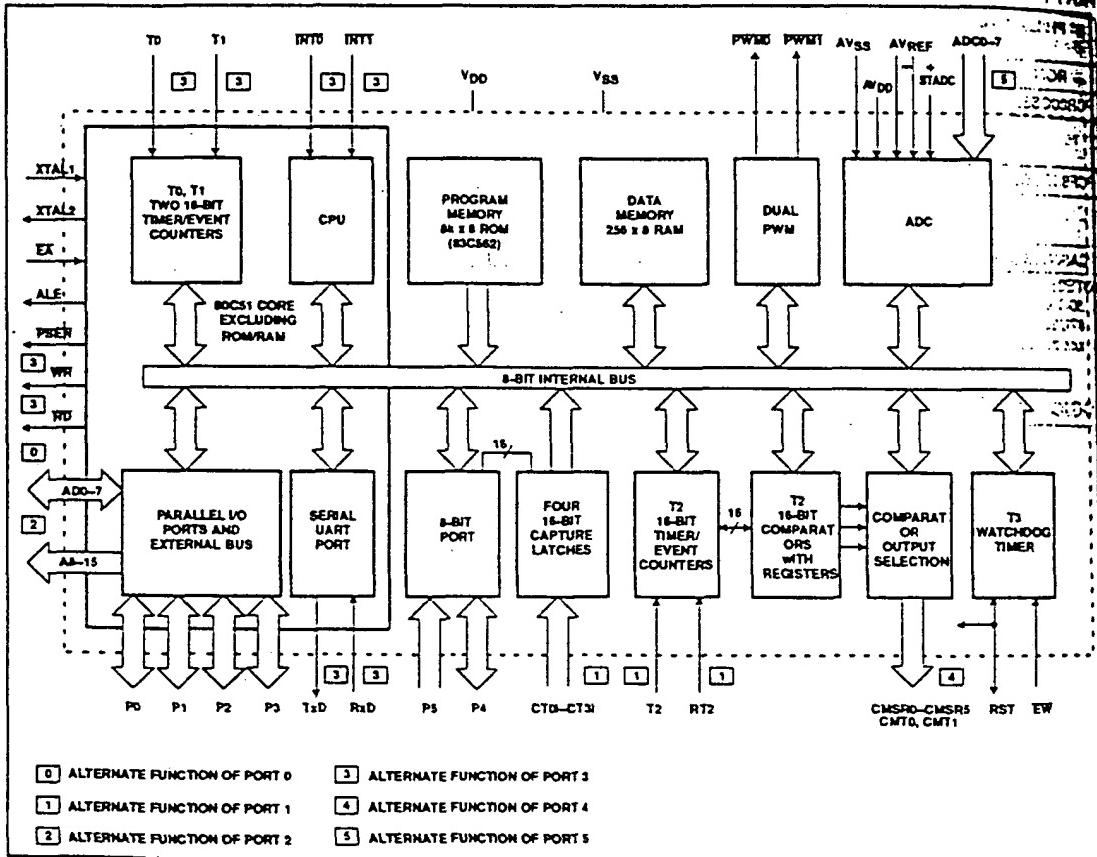


Single-chip 8-bit microcontroller

80C562/83C562

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BLOCK DIAGRAM



Appendix BB



**National
Semiconductor**

COP420/COP421/COP422 and COP320/COP321/COP322 Single-Chip N-Channel Microcontrollers

General Description

The COP420, COP421, COP422, COP320, COP321 and COP322 Single-Chip N-Channel Microcontrollers are members of the COPSTM family, fabricated using N-channel, silicon gate MOS technology. They are complete microcomputers containing all system timing, internal logic, ROM, RAM and I/O necessary to implement dedicated control functions in a variety of applications. Features include single supply operation, a variety of output configuration options, with an instruction set, internal architecture and I/O scheme designed to facilitate keyboard input, display output and BCD data manipulation. The COP421 is identical to the COP420, except with 19 I/O lines instead of 23; the COP422 has 15 I/O lines. They are an appropriate choice for use in numerous human interface control environments. Standard test procedures and reliable high-density fabrication techniques provide the medium to large volume customers with a customized Controller Oriented Processor at a low end-product cost.

The COP320 is the extended temperature range version of the COP420 (likewise the COP321 and COP322 are the extended temperature range versions of the COP421/COP422). The COP320/321/322 are exact functional equivalents of the COP420/421/422.

= 0.8V, "1" =
= 1.2V, "1" =

TION)
provide for standard
ammed COP414L
odes are provided.

SI = 1)

be employed by the
ng tests only.

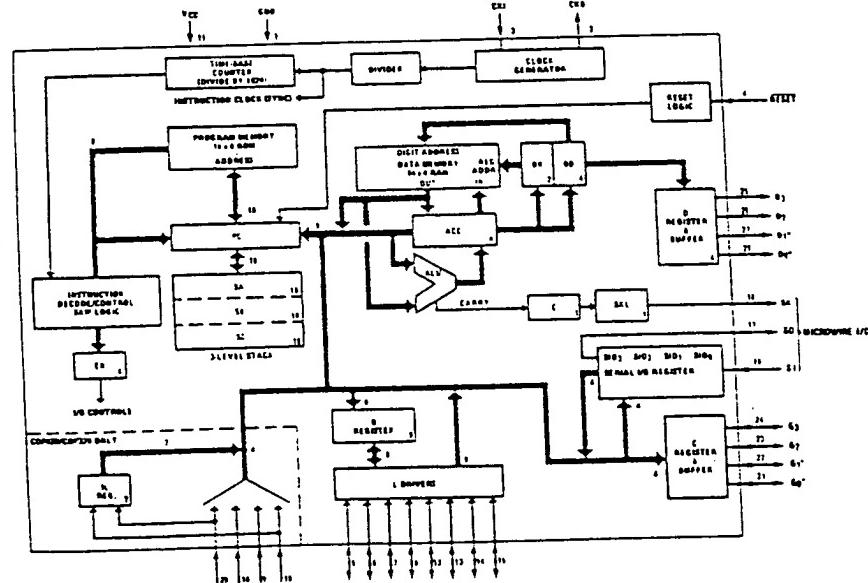
it with the EPROM.

-4 DRIVER
VCC PIN
L3 DRIVER
L2 DRIVER
L1 DRIVER
L6 DRIVER
SI INPUT
SO DRIVER
SK DRIVER
GROUND PIN
G0 I/O PORT
G1 I/O PORT
G2 I/O PORT
G3 I/O PORT
CKO OUTPUT
CKI INPUT
RESET INPUT
L7 DRIVER
L6 DRIVER
L6 DRIVER
L INPUT LEVELS
G INPUT LEVELS
SI INPUT LEVELS

Features

- Low cost
- Powerful instruction set
- 1k x 8 ROM, 64 x 4 RAM
- 23 I/O lines (COP420, COP320)
- True vectored interrupt, plus restart
- Three-level subroutine stack
- 4.0 μ s instruction time
- Single supply operation
- Internal time-base counter for real-time processing
- Internal binary counter register with MICROWIRE™ compatible serial I/O capacity
- General purpose and TRI-STATE® outputs
- TTL/CMOS compatible in and out
- LED direct drive outputs
- Software/hardware compatible with other members of COP400 family
- Extended temperature range device COP320/COP321/COP322 (-40°C to +85°C)

Block Diagram



TU/DO/6921-1

FIGURE 1

1-115

786

CATALINA CONTROLS CORPORATION

Features of the Microprocessor-Based

Distribution Products Family

D. P. Lerner

Sept. 29, 1986.

012173

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Relay Sequence / Fault Display Test
 Momentary Contact Switch / LED Test
 Thermostat / Heater LED Test
 Cautionary Note on Exiting TEST STATE

| PART IV. SPA PRODUCT |

**

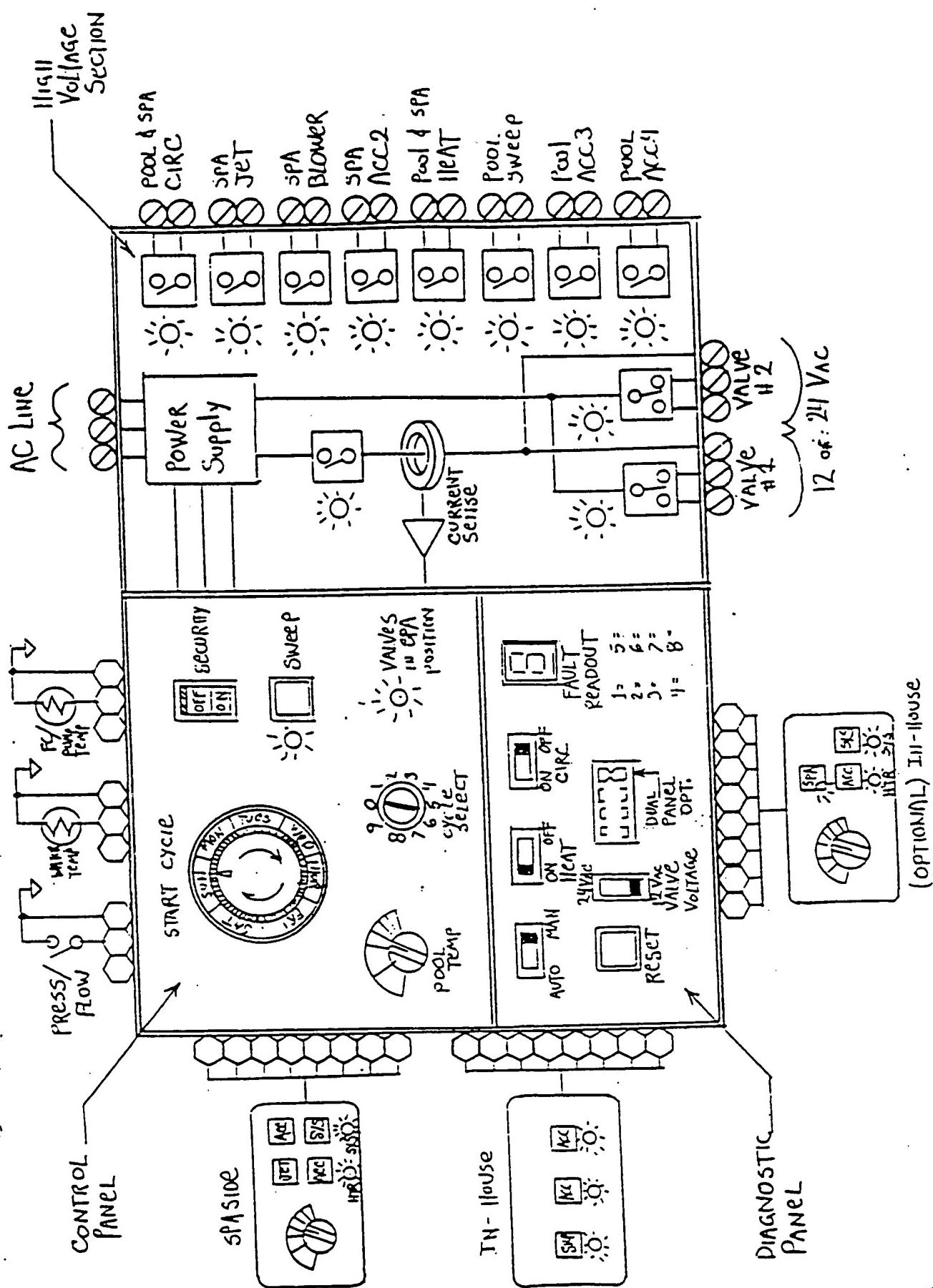
| PART V. POOL PRODUCT |

**

**
 These products are not yet documented, but
 may be addressed in a separate contract.
 The software is complete and functional
 and is covered in "Distribution Product
 Family Software Specification".

Pool + SPA Controller

DPL 9/30/86

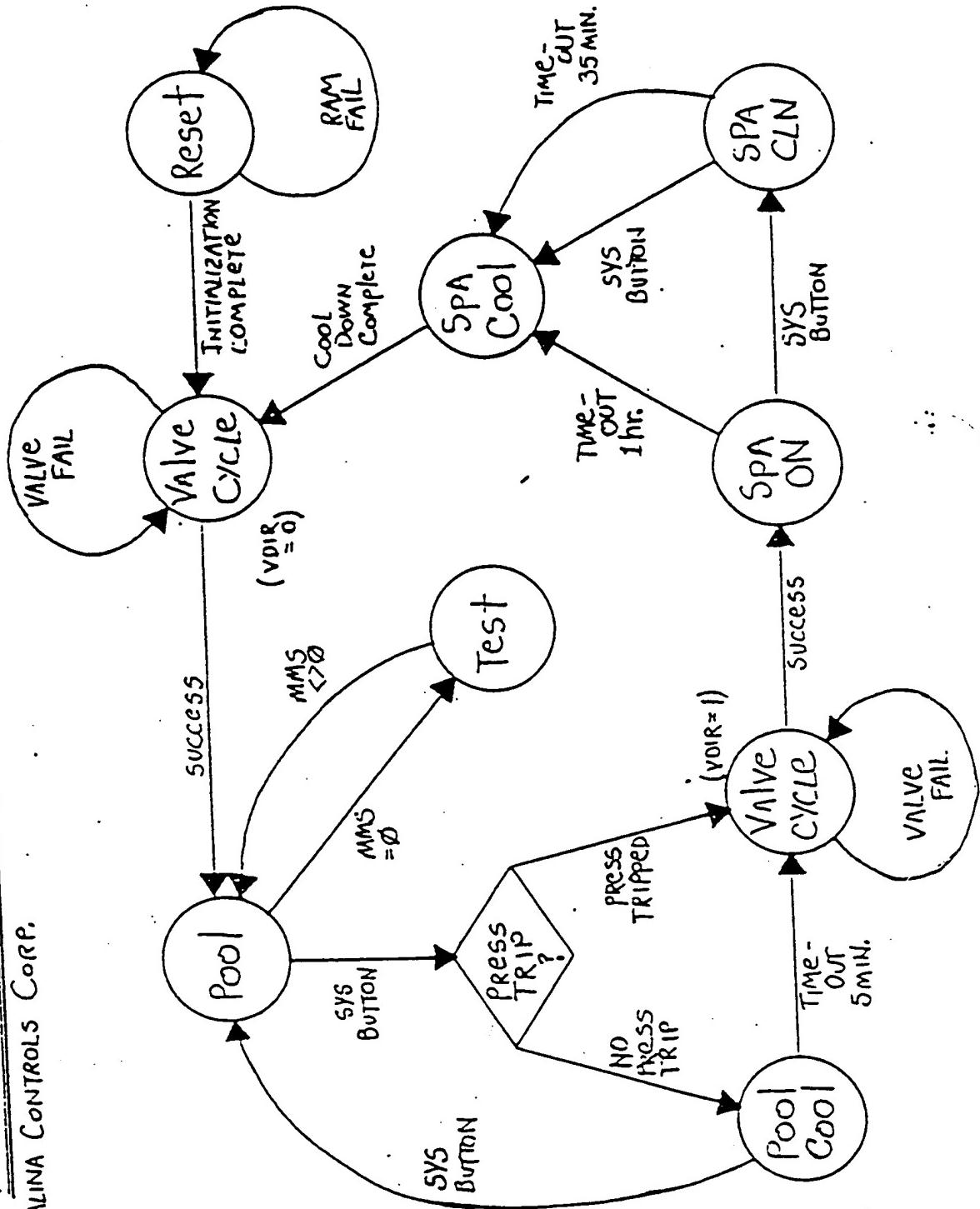


Pool + Spa Controller : STATE DIAGRAM

CATALINA CONTROLS CORP.

D. P. LERNER 11/30/88

O. P. Lerner '73/88



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Features of the Microprocessor-Based Distribution Product Family

UPDATED 09/29/86

DPL

This document describes the functions and features of the Distribution Product Family based on the Intel 8051 microprocessor from a marketing/service perspective. Actual specifications for the product are contained in documents "Distribution Product Family Software Specification" and "Distribution Product Family Hardware Specification" (yet to be written).

The Distribution Product Family consists of 3 products: the Pool + Spa, Spa, and Pool Controllers. The Pool + Spa product has 11 relay outputs, while the Spa and Pool Controllers have 5 channels and will utilize a common PWA. One microprocessor program supports all three products.

I PART I. SYSTEM SAFETY & RELIABILITY I

The system has been designed for reliability. Features include:

RAM Test: When the system is powered on, the microprocessor memory is automatically tested by writing a unique pattern into each memory location, reading each location, and verifying the value read was correct. This is repeated for three unique patterns (`(01010101)`, `(10101010)`, and `(00000000)`). If the memory test fails, the fault indicator displays an "8" and all system LED's are set flashing ON/OFF. Power must be re-applied to reset.

Watchdog Timer: A timer is provided that under normal operating conditions is restarted by the microprocessor before it can time-out. If the microprocessor should fail to re-start the timer within 1/2 second, that timer will time-out and automatically reset the microprocessor. This feature prevents the microprocessor from "hanging".

MOV Power Line Transient Supression: an MOV is included across the input power lines that will absorb some conducted line transients from inductive switching or lightning sources.

Power Line Filter: a filter is included in series with the incoming power lines that serves to reduce conducted line transients that might interfere with reliable operation of the microprocessor circuit (and also guarantee compliance with FCC regulations for limiting conducted RF noise emanating from our product).

Power Line Monitor: A circuit is provided which detects "glitch" transients or "brown out" low line voltage conditions (after the line filter) and guarantees the microprocessor is reset at the end of any power condition that could potentially result in erratic operation of the system.

Low Voltage I/O Protection: All low voltage input and output lines are protected by RC filters similar the "panel filter" design proven effective against transient damage on our RC4 & RC7 products. In addition, all low voltage I/O is energy limited to within the UL specified limit of < 5 mA and < 15 V.

Increased Relay Load Capacity: 4 Relays intended to switch large inductive loads have been increased in size to enhance system reliability. Each relay is independently field replacable.

Relay Transient Suppression: The 4 enhanced capacity relays are equipped with MOV's connected in parallel with their load contacts to reduce radiated and conducted transients. This should serve to lengthen contact life and enhance microprocessor reliability.

I PART II. CONTROLLER AC LINE VOLTAGE REQUIREMENTS |

The controller electronics operate off of 115/220 VAC, 50/60 Hz. Since the internal software timers operate off line voltage cycles, a jumper input must be cut to change the program to 50 Hz. To convert the product to 220 VAC Operation, the power supply (and valve) transformer(s) must be changed to a special 220 VAC unit.

| PART III. POOL + SPA PRODUCT |

I. Inputs and Outputs

A. External Low Voltage Inputs & Outputs

Spaside Panel (standard): utilizes an 8 position NR type connector compatible with Catalina's RSP0/RSP1/RSP2 panels. Functions include:

- 1) Water Temperature setpoint potentiometer scaled 70 to 104 deg. F.
- 2) JET momentary contact button.
- 3) SYStem momentary contact button.
- 4) ACCessory 1 (blower) momentary contact button.
- 5) ACCessory 2 (light) momentary contact button.
- 6) HTR (HeaTeR) on - indicating LED
- 7) SYStem on - indicating LED

Master/In-house Panel (optional): utilizes an 8 position NR type connector compatible with Catalina's Master RSP0/RSP1/RSP2 panels. Functions include:

- 1) Water Temperature setpoint potentiometer scaled 70 to 104 deg. F.
- 2) SPAside momentary contact button.
- 3) SPAside panel on - indicating LED.
- 4) ACCessory 2 (light) momentary contact button.
- 5) SYStem momentary contact button.
- 6) HTR (HeaTeR) on - indicating LED.
- 7) SYStem on - indicating LED.

In-house Pool Panel (standard): utilizes and 8 position NR type connector compatible with Catalina's other panels (although no specific panel has been designed yet). Functions include:

- 1) SWP (SWeeP) momentary contact button.
- 2) SWP on - indicating LED.
- 3) ACCessory 3 momentary contact button.
- 4) ACCessory 3 on - indicating LED.
- 5) ACCessory 4 momentary contact button.
- 6) ACCessory 4 on - indicating LED

Water Temperature Sensing (WTS) thermistor. Curve Z type used currently in Catalina's standard product.

Pump Temperature Sensor thermistor. Cvrve Z type, mounted in the impeller of the booster/sweep/cleaner pump to sense failure-to-prime condition -(overtemperature). Feature may be defeated by replacing sensor with a fixed resistor (27 K to 4.7 K ohm).

Pressure Flow/Switch input accepts a sensor that is closed when adequate pressure/flow is sensed. Feature may be defeated by replacing sensor with a jumper.

B. Controller Front Panel Inputs and Outputs

SWP (SWeeP) Momentary button / LED controls demand for pool sweep booster/cleaner pump. LED reflects status of the button.

Pool Thermostat: scaled 50 to 94 deg F.

Security Toggle Switch controls response of all buttons and thermostats external to the control box front panel. When security switch is ON, all external control inputs are DISABLED.

Valve Position Indicator LED is ON when valves are in SPA POSITION.

Low Voltage, 7 Day Timerclock specifies when pool maintenance cycle is to be INITIATED. 2 hour resolution, 12 set-tabs per day, timeset to within 15 minutes.

Maintenance Cycle Select Rotary Switch specifies length of circulate and sweep cycles initiated when timerclock is activated. Active positions include "1" through "9". Position "0" is reserved to initiate self diagnostic tests. Chart provided defines cycle durations versus switch position. Note the sweep + circulate portion of the cycle is executed at the END OF THE MAINTENANCE CYCLE.

Switch Pos.	Circ Pump Time	Circ + Sweep Time	Total Time
1	2 hr. 12 min.	48 min.	3 hr.
2	5 hr. 12 min.	48 min.	5 hr.
3	3 hr.	3 hr.	6 hr.
4	6 hr. 30 min.	1 hr. 30 min.	8 hr.
5	5 hr.	3 hr.	8 hr.
6	7 hr.	3 hr.	10 hr.
7	10 hr.	4 hr.	14 hr.
8	15 hr.	5 hr.	20 hr.
9	23 hr. 48 min.	-	23 hr. 48 min.
0	<-----	Self Test Mode ----->	

C. Diagnostic / Service Panel Inputs and Outputs

11 LED's reflect the status of the drive to each system relay. LED is ON when relay drive is active.

Fault/Status Display. A seven segment LED displays numbers corresponding to system status. Status is defined according to a chart provided on the diagnostic panel. When multiple faults are active, display cycles through sequence over and over. Displayed states include:

Display	System Status
1	High Limit (Pump Overtemp.) Trip
2	Pressure Switch Not Closed Trip
3	Water Temperature Sensor Freeze Condition
4	Missing Water Temperature Sensor
5	Pump Sensor Freeze Condition
6	Suction Valve Failed
7	Pressure Valve Failed
8	Microprocessor Memory Failed

Product Configuration Inputs: Inputs are provided to specify whether optional Master Spa Panel is used and whether 2 separate pumps are used for spa circulate and jet or whether a single 2 speed pump is used. Fail programming device states are defined:

Dual Panel Option:

- * PUNCH OUT for system with Master Panel.
- * DO NOT PUNCH OUT for systems with no Master Panel.

2 Pump Option:

- * PUNCH OUT for 2, separate jet and circulate pumps (or systems w/ circ pump only - no jet pump).
- * DO NOT PUNCH OUT for systems using a 2 speed pump for circulate (low speed) and jet (high speed).

Reset Momentary Contact Button is used to reset the microprocessor. Function is useful if, for example, a maintenance cycle is initiated (while setting the timeclock) and the operator wishes to cancel the cycle.

Manual/Auto Switch:

AUTO Position: Normal operation. Disables manual heater and circulate switches (i.e. system will ignore the positions of manual heater and circulate switches).

MANUAL Position: Opens all relays (cuts 24 Vdc) except heater and circulate which are controlled by the manual circulate and heat switches.

Circulate Pump Manual Override Switch: When the AUTO/MAN. switch is in the MAN. position, the circ slide switch directly controls the relay switching the circulate pump on/off. When AUTO/MAN. switch is in the AUTO position, the manual circ. switch position is ignored.

Heater Manual Override Switch: When the AUTO/MAN. switch is in the MAN. position, the heater slide switch directly controls the relay switching the heater thermostat circuit on/off. When the AUTO/MAN. switch is in the AUTO position, the manual heater override switch position is ignored.

WARNING - NOTE the thermostat supplied on the heater must be readjusted to regulate water temperature when the controller is set to MANUAL mode and the manual heater override is ON. The Pool + Spa thermostatic temperature control feature DOES NOT OPERATE when the heater override is active and may result in excessively high water temperatures.

Valve Voltage Select Slide Switch: Reconfigures the voltage output of the valve driver supply transformer to supply 12 or 24 VAC.

D. Control (Relay) Outputs

The relay sequence is defined by the order in which they are switched in the self-diagnostic test routine. This may (& should) be changed so that the relays switch in a logical/natural sequence consistent with the hardware design. The file that orders the self-test sequence is D:AMERICAN\80S1\PNSTEE.S (also on floppy disk).

Current Relay Self Test Sequence is:

Relay No.	Label	Relay Function
1	KCIRC	Circulate Pump (or low speed)
2	KJET	Spa Jet Pump (or high speed)
3	KBLOW	Spa Blower / ACCessory 1
4	KACC2	Spa Light / ACCessory 2
5	KHEAT	Heater pilot-duty relay
6	KSWP	Pool Sweep/booster/cleaner pump
7	KVPWR	Valve Power On/Off relay
8	KVBLW	Pressure Outlet Valve Direction Control
9	KVSCK	Suction Inlet Valve Direction Control
-	VACC3	Pool ACCessory 3
-	VACC4	Pool ACCessory 4

Note relays ACC3 & ACC4 are not switched in the self test sequence (but are directly controlled by the ACC3/4 momentary contact switches). SEE description of TEST STATE below.

Relay Ratings:

Label	Field Replace	Terminal Positions	Rating
KCIRC	Yes	4	DPST, 2 HP, 240 VAC (24 Vdc)
KJET	Yes	4	DPST, 2 HP, 240 VAC (24 Vdc)
KBLOW	No	2	SPST, 30A, 240 VAC
KACC2	No	2	SPST, 30A, 240 VAC
KHEAT	No	2	SPST, 30A, 240 VAC
KSWP	Yes	4	DPST, 1 HP, 240 VAC (24 Vdc)
KVPWR	No	2	SPST, 30A, 240 VAC
KVBLW	No	3	SPDT, 30A, 240 VAC
KVSCK	No	3	SPDT, 30A, 240 VAC
KVACC3	Yes	4	DPST, 2 HP, 240 VAC (24 Vdc)
KVACC4	No	2	SPST, 30A, 240 VAC

II. Summary of System Features

A. Flush Cycle

INITIATION: The FLUSH CYCLE timer is started the first time the JET or CIRC pump is turned on when neither had been on before.

Note there are many stimuli that result in circulate pump demand including maintenance cycle (circ or circ + sweep phases), sweep demand, system in SPA STATE (ON or CLEAN cycles), Freeze condition, Valve Failure, etc. FLUSH CYCLE is initiated when the criteria stated above is satisfied, regardless of demand source.

DURATION: 5 minutes in POOL STATE and SPA STATE.

FUNCTION: As long as the FLUSH CYCLE timer is active:

- 1) The HEATER is HELD OFF allowing a sufficient volume of water to move through the system to result in an accurate assessment of heat demand. This delay prevents "smart cycling" heater due to a localized water temperature reading.
- 2) The SWEEP PUMP is HELD OFF until the circulate and/or jet pump provides sufficient prime to the sweep pump.
- 3) The PRESSURE SWITCH input is IGNORED allowing the system to prime itself without tripping a pressure switch failure.

RESET: when either:

- 1) FLUSH CYCLE timer has timed out.
- 2) Cessation of all demand for CIRC AND JET pump ON.
(i.e. FLUSH CYCLE timer is reset to zero when demand for CIRC AND JET pumps become inactive.)
- 3) System is advanced to TEST, POOL-COOL, or SPA-CLN STATE.

B. Pump High Limit Trip

INITIATION: The PUMP HIGH LIMIT will trip any time that the SWEEP pump (not the SWEEP button) is ON and the PUMP TEMP. SENSOR (mounted in the impeller housing) is subjected to a temperature above 122 deg. F. Trip indicates failure to achieve pump prime. 5 Degrees of hysteresis is provided in the temperature sensing circuit.

DURATION: Until reset.

FUNCTION: Until reset:

- 1) Forces SWEEP PUMP OFF. Prevents pump damage.
- 2) Flashes SYSTEM, HTR (heater), SWP (sweep), VPOS (valve position), and SPAside-on LED's ON/OFF at the fault-flash rate.
- 3) Displays "1" on the diagnostic panel fault indicator.

RESET: by any of the following (which effectively turn off the sweep pump):

- 1) By cycling SWEEP Button OFF.
- 2) By termination (time-out) of the maintenance cycle.
- 3) By driving the system out of POOL STATE.

C. Pressure Switch Trip

INITIATION: Whenever CIRC or JET pump is ON and FLUSH CYCLE is NOT active and PRESSURE switch input is NOT GROUNDED. Note that the PRESSURE switch input is heavily filtered in software to help minimize nuisance tripping. Trip indicates no water, no flow, or faulty switch.

DURATION: Until reset.

FUNCTION: Until reset.

- 1) Holds CIRC, JET, and SWEEP pumps OFF.
- 2) Holds HEATER OFF.
- 3) Flashes SYSTEM, SPAside, HTR (heater), SWP (sweep), and VPOS (valve position) LED's ON/OFF at the fault flash rate.
- 4) Displays "2" on the diagnostic panel fault indicator.

RESET: anytime the system is advanced through operator or timebase initiation, the PRESSure TRIP is reset and the system is allowed to again attempt to achieve prime. Reset conditions include:

- 1) Start of the maintenance cycle.
- 2) End of the maintenance cycle.
- 3) IN POOL STATE: When system is advanced toward SPA or TEST STATE's.
- 4) IN POOL STATE: Any time the SWEEP button is toggled ON or OFF.
- 5) IN SPA STATE: When system is advanced to SPA CLEAN state.
- 6) IN SPA STATE: When system is advanced from SPA CLEAN towards POOL STATE.

D. Valve Cycle Failure

INITIATION: When the valves are directed to rotate from POOL to SPA position or vice versa, 2 seconds are allowed for the controlling relays to switch and current begin to flow into the actuator motors. If current does not cease flowing within 1 minute (i.e. if the valve actuator does not reach the limit switch at the end of its travel range and open the drive current circuit) then a VALVE FAIL TRIP will occur.

DURATION: Until reset.

FUNCTION: The following items specify the valve cycle:

- 1) All pumps and the heater are turned off at the start of the valve cycle.
- 2) Valves are rotated one at a time to minimize drive current requirements (and transformer size).
- 3) The valve sequence is critical in case a valve fails:

FROM SPA TO POOL:

- a. SUCTION inlet valve moved FIRST.
- b. PRESSURE outlet valve moved LAST.

FROM POOL TO SPA:

- a. PRESSURE outlet valve moved FIRST.
 - b. SUCTION inlet valve moved LAST.
- 4) 2 seconds are allowed for the valves to begin motion. Up to 1 minute is allowed for the valves to reach their limit.
- 5) When either valve fails to reach its limit within the allotted time, a VALVE CYCLE FAILURE occurs:
- a. JET and SWEEP pumps are held OFF.
 - b. HEATER is held OFF.
 - c. CIRC pump is turned ON.
 - d. SYSTEM, SPAside-on, HTR (heater), SWP (sweep), and VPOS (valve position) LED's are set flashing ON/OFF at the fault-flash rate.
 - e. The fault display indicator on the diagnostic panel is set to display "6" for suction valve fail or "7" for pressure valve fail.

RESET: Requires system power be cycled OFF then ON again or press RESET button on the diagnostic panel.

E. Missing Water Sensor Protection

INITIATION: Condition is active whenever the apparent temperature of the Water Temperature Sensing thermistor is colder than 20 deg F. (Negative temperature coefficient thermistors, such as the curve Z type we use, exhibit increased resistance with decreased temperature. Therefore, a missing thermistor has the same resistance as a very cold thermistor, i.e. a very large value.)

Failure to detect a missing water temperature sensor could result in unlimited water temperature or a potential fire hazard.

DURATION: Until initiating condition is no longer active.

FUNCTION: when condition is active:

- 1). Turns ON CIRCulate pump.
- 2) Set SYSTEM, SPAside-on, HTR (heater), SWP (sweep), and VPOS (valve position) LED's flashing ON/OFF at the fault-flash rate.
- 3) Displays "4" on the diagnostic panel fault indicator.

RESET: Automatic reset when the WTS detects temperature has risen above 25 deg F.

F. Freeze Protection (PUMP SENSOR)

INITIATION: Whenever the temperature of the Pump Temperature Sensor falls below 35 deg F.

DURATION: As long as initiating condition is active.

FUNCTION: When condition is active:

- 1) Turns on CIRC pump.
- 2) Causes diagnostic fault indicator to display "5".

Note when the system is in SPA STATE, when a separate JET pump is used, and a PUMP SENSOR Freeze Condition is detected BOTH the CIRC AND JET pumps are turned ON.

RESET: When the Pump Sensor detects temperatures above 40 deg. F.

G. Freeze Protection (WATER TEMPERATURE SENSOR)

INITIATION: Whenever the Water Temperature Sensor detects temperatures between 35 and 20 deg F. (Temperatures lower than 20 deg F are assumed to be the result of a missing sensor).

DURATION: As long as initiating condition persists.

FUNCTION: While condition is active:

- 1) CIRC pump is ON
- 2) HEATER is enabled (after FLUSH CYCLE).
- 3) Diagnostic panel fault indicator displays "3".

Note when system is in SPA STATE, a separate JET PUMP is used, and a (Water Temp. Sensor) Freeze Condition is detected, BOTH the CIRC and JET pumps are turned ON.

RESET: When the water temp. sensor detects the temperature is above 40 deg F.

H. Cool Down Cycle

INITIATION: The COOL CYCLE Timer is loaded whenever:

- 1) The HEATER relay OPENS.
- 2) The system enters PCOL COOL STATE.

DURATION: 5 minutes.

FUNCTION: Runs the CIRCulate pump to cool down the heater element. Prevents build-up of scale, eliminates scald hazard.

RESET: Advancing system to TEST STATE, or COOL CYCLE timer time-out.

I. Automatic Time-out Off: SYStem Button

INITIATION: The SYStem TIMER is loaded when the system is advanced to SPA-ON STATE.

DURATION: Timer load value is 1 hour.

FUNCTION: Automatically shuts off SYStem button when the SYStem TIMER times out, and advances the system towards POOL STATE (actually to SPA-COOL STATE).

This feature serves to guarantee the system is returned to POOL STATE after use of the spa.

RESET: SYStem timer is reset when system state is advanced out of SPA-ON STATE, or when it times out.

J. Automatic Time-out Off: SPA-CLEAN STATE

INITIATION: Advancing the system to SPA-CLEAN STATE (by pressing the SYStem button from the SPA-ON STATE) causes the SYStem TIMER to be loaded with the SPA-CLEAN time-out off load value.

DURATION: 35 Minutes.

FUNCTION: While the timer is active:

- 1) The CIRC pump is ON
- 2) The JET and BLOWER buttons are disabled.
- 3) The HEATer is OFF.
- 4) The SYStem LED is set to "clean flash" (4.5 sec Off, .2 sec On).

This feature provides opportunity for the spa water to be filtered, and the heater to cool down before the system returns to POOL STATE.

RESET: The function is reset when the SYStem TIMER times-out or when the system is advanced from SPA-CLEAN STATE by pressing the SYStem button.

K. Security Switch

INITIATION: Security function is active when the toggle switch on the controller front panel is in the ON position.

DURATION: Until reset.

FUNCTION: Locks all control panels and thermostats OFF that are external to the controller itself. When SECURITY is active, the spa side panel, the in-house master panel, and in-house pool panel are disabled, and the pool thermostat mounted on the controller front panel is used to control water temperature.

This feature allows the pool + spa system to be secured against tampering (by turning security ON and locking controller box closed) while still providing routine filtering and heating of the water.

RESET: by positioning the security switch OFF.

L. Automatic Sweep Pump Priming

INITIATION: Whenever the SWEEP button is turned ON and the CIRCulation pump had not been ON previously, the pump prime cycle is run.

DURATION: Cycle runs off the FLUSH CYCLE timer. Duration is 5 min.

FUNCTION: Turning the SWEEP button ON, creates demand for both CIRC and SWEEP pumps. (i.e. the CIRC pump must be running anytime the SWEEP pump is ON.)

If the CIRC pump was not ON prior to pressing the SWEEP button, then a FLUSH CYCLE is initiated (see FLUSH CYCLE above for more information). The SWEEP pump relay is not allowed to close while a FLUSH CYCLE is active. As a result, for the first 5 minutes after the SWEEP button was pressed, only the CIRC pump runs providing prime for the SWEEP pump. After the FLUSH CYCLE times out, the SWEEP pump is allowed ON and both the CIRC and SWEEP pumps are run together.

If the CIRC pump had been running for more than 5 minutes prior to pressing the SWEEP button, the FLUSH CYCLE will have already timed-out and the SWEEP pump will come ON immediately when the button is pressed.

III. System Operation

The system advances through 8 operational states as depicted in the state diagram attached to this document. Please refer to this diagram and the system block diagram while reading the following description of how the system state is advanced and the relationship between the operating states.

When power is first applied to the controller, the system comes up in the RESET STATE. In the RESET STATE, the microprocessor program is initialized and all relays, LED's, timers are reset, and a test of memory (RAM TEST) is performed. If the RAM TEST was successful, the processor has been initialized and the system will automatically advance to the VALVE CYCLE STATE.

In the attached state diagram, the circle labeled "RESET" represents the RESET STATE, the arrow labeled "RAM Fail" depicts the fact that if the RAM TEST FAILS, the system remains in the RESET STATE. The arrow labeled INITIALIZATION COMPLETE depicts the system advancing to the VALVE CYCLE STATE after successfully completing the functions of the RESET STATE.

The STATE circle labeled "VALVE CYCLE" symbolizes the logic (program) that moves first the suction inlet valve and then the pressure outlet valve to the POOL position. If the valves are moved successfully (i.e. both valves operate fully and activate their limit switches) the the system advances to the POOL STATE. IF either valve fails to operate fully, the VALVE CYCLE FAILS and the system does not advance.

This sequence is depicted graphically on the state diagram. After following the arrow on the state diagram from RESET to VALVE CYCLE STATE, one sees there are only 2 arrows leaving the VALVE CYCLE STATE. The arrow labeled "Fail" symbolizes the event that the VALVE CYCLE timer times-out before either valve reaches its limit switch and loops back to the VALVE CYCLE STATE. The arrow labeled "Succeed" symbolizes the system successfully completed valve actuation. If the valves were already in POOL position when the system entered VALVE CYCLE STATE, . the system will advance to POOL STATE in about 4-5 seconds.

If the VALVE CYCLE ended in success, the valves are now in the POOL position and the system is in the POOL STATE. In this position, water flow will be directed from the pool through the heater and pump and back to the pool. IF, on the other hand, the VALVE CYCLE failed, power must be cycled off/on (or the RESET button pressed) to re-start the system from the RESET STATE.

Operation of the system in the POOL STATE (and all other states) is described in detail below. Generally, the POOL STATE logic covers all the operations of thermostatic heater control, pool circulate and pool cleaner pump cycles, plus 3 accessories.

If, when the system is in POOL STATE, the Maintenance Cycle Select Switch is rotated to position "0", depicted by the arrow labeled "MMS = 0" on the state diagram, the system will advance to TEST STATE. TEST STATE includes operating logic to test the independent function of each momentary contact switch, the 11 control relays, all system LED's, the water temperature sensor, 2 thermostats, and the fault indicating display (or optionally - 3) on the diagnostic panel. The system will remain in the TEST STATE until the Maintenance Cycle Select Switch is rotated to any non-zero position. When the switch is rotated off "0", the system returns to POOL STATE which is symbolized by the arrow labeled "MMS () 0" in the diagram.

In general, the SYStem button is used to switch the controller between SPA and POOL control functions. Thus, the system is advanced from the POOL STATE to the POOL COOL STATE by pressing the SYStem momentary contact button. (If a master panel is used, the SPAside-on button must be ON to enable the spaside SYStem button).

The POOL COOL STATE is 5 minute-wait state in which the SYStem LED and the CIRCulate pump are ON. POOL COOL serves to guarantee the heater is cooled down before heater outlet flow is directed into the spa. The operator may abort the POOL COOL STATE and return to POOL STATE by pressing the SYStem button again during the POOL COOL cycle (shown as the arrow labeled "SYS button" leading from POOL COOL to POOL STATE).

If a PRESSure Switch TRIP occurred in the POOL STATE prior to pressing the SYStem button, the POOL COOL STATE is skipped (since the heater could never have fired), the PRESSure Switch TRIP is RESET, and the system will advance directly to the VALVE CYCLE STATE. The diamond shaped symbol appearing halfway down the length of the arrow labeled "SYS button" in the state diagram is a "decision block" or branch test. When the SYStem button is pressed in the POOL STATE, the system advances towards POOL-COOL STATE (down arrow labeled "SYS button") until the decision block is encountered. If a PRESSure Switch TRIP is NOT ACTIVE the system advances to POOL-COOL (branch labeled "NO P-TRIP"), otherwise the system advances to VALVE CYCLE STATE (branch "P-TRIP").

If the POOL-COOL STATE COOL CYCLE is completed, the system will automatically advance from POOL COOL to VALVE CYCLE STATE (see arrow labeled "Time-out 5 min." leading to VALVE CYCLE STATE). In VALVE CYCLE STATE (the same program as discussed above) first the pressure outlet, and then the suction inlet valves are directed to the SPA position to direct water flow from the spa through the heater and circulate pump and back to the spa.

The valves will either fully actuate (follow arrow "Succeed") and the system advance to SPA-ON STATE or fail to actuate (follow arrow "Fail") and hold the system in the VALVE CYCLE until a system RESET occurs (by cycling power off/on or by pressing the reset button).

The SPA-ON STATE allows normal use of the spa including thermostatic heater control, jets, blower, and 3 accessories. Pressing the SYStem button from SPA-ON STATE will advance the system to the 35 minute SPA-CLEAN clean-up/cool down spa STATE (see arrow labeled "SYS button" leading from SPA-ON to SPA-CLEAN STATE).

If the SYStem button is not pressed in the SPA-ON STATE, the system will automatically proceed to SPA-COOL STATE after 1 hour (see arrow from SPA-ON STATE to SPA-COOL STATE labeled "Time out 1 hr.").

While the system is in SPA-CLEAN STATE, the SYStem LED will flash for .2 sec's every 4.5 sec's while the CIRCulate pump is held ON, the HEATER is OFF, the BLOWer and JET are disabled, and the accessories ACC2, 3, and 4 may be independantly switched On or OFF.

From the SPA-CLEAN STATE, the system will automatically time-out after 35 minutes and advance to the SPA-COOL STATE or may be immediately advanced to the SPA-COOL STATE by pressing the SYStem button.

The SPA-COOL STATE holds the JET, BLOWer, SWEEP, and HEATer loads OFF and the CIRCulate pump ON while the COOL CYCLE timer times-out. If the COOL CYCLE Timer was not active when the system advanced to SPA-COOL STATE it is immediately advanced to the VALVE CYCLE STATE. Once the COOL CYCLE times-out in SPA-COOL STATE, the system is automatically advanced to the VALVE CYCLE STATE.

Entering VALVE CYCLE STATE from SPA COOL STATE is exactly the same as entering that state from RESET STATE. The valves are again switched to POOL position and the cycle is begun again.

The following sections describe each system operating state in detail.

A. SPA button Operation

In systems using the optional Master Spa Panel (i.e. systems using dual spa panels), the SPA button on the Master panel is pressed to toggle the spaside control panel ON/OFF. The SPA LED indicates the status of the SPA button. The Spaside panel is always enabled in systems not using a Master panel.

The punch-out foil program device on the diagnostic panel is used to inform the processor whether the system uses dual panels at power up. The status of the program input determines whether the SPA button is set ON (single panel) or OFF (dual panels) at initial power on.

When the SECURITY switch on the controller panel is ON, the SPA button (as well as many other functions) is turned OFF and is disabled.

The SYStem, ACC2 and SPA buttons on the Master panel, and the ACC2 button on the Spaside panel are enabled anytime the SECURITY switch is OFF.

When the SPA button is ON, the SYStem button on the Spaside panel is enabled. If the system is in SPA-ON STATE and the SPA button is ON, the JET and ACC1 (BLOWer) buttons on the spaside panel are also enabled and the thermostat on the spaside panel is used to determine heat demand.

When the SPA button is OFF, the SYStem, ACC1 (BLOWer), and JET buttons on the spaside panel are reset OFF and disabled. If the controller is in SPA-ON STATE and the SPA button is OFF, heat demand is determined by the setting of the thermostat on the Master panel.

B. POOL STATE

Maintenance Cycle: Closure of the low-voltage timeclock contact initiates the MAINTENANCE CYCLE. The cycle is comprised of 2 subcycles. The first subcycle runs just the CIRCulation pump. The second subcycle runs both the CIRCulate and SWEEP pumps.

The microprocessor reads the position of the rotary maintenance cycle select switch AT THE INSTANT THE TIMECLOCK CONTACTS CLOSE to determine the duration of the circulate-only subcycle. Once this cycle has started it can only be reset by cycling system power off/on or by pressing the RESET button on the diagnostic panel.

The microprocessor also reads the position of the rotary maintenance cycle select switch AT THE INSTANT THE CIRCULATE-ONLY SUBCYCLE IS COMPLETED to determine the duration of the circulate + sweep subcycle. The SWEEP pump may be overridden OFF during the circulate + sweep subcycle by pressing the SWEEP button OFF. The CIRC pump will run until the end of the circulate + sweep subcycle unless system power is cycled off/on or the RESET button on the diagnostic panel is pressed.

The SWEEP button is automatically turned OFF at the END OF THE CIRCULATE + SWEEP SUBCYCLE regardless of whether it was turned on manually (using the SWEEP button) or automatically (as part of the maintenance cycle). This limits running the SWEEP PUMP to 24 consecutive hours.

Once the maintenance cycle is started, it may be interrupted to use the spa, run test diagnostics etc, BUT THE MAINTENANCE TIMER CONTINUES TO DECREMENT THE CYCLE TIMER REGARDLESS OF THE INTERRUPTION. When the interruption is over and the system returned to POOL STATE, the maintenance cycle will continue FROM WHEREVER IT IS CURRENTLY IN ITS CYCLE (NOT where it WAS when the interruption occurred).

SWEET Button: Toggles sweep demand ON/OFF. The LED's associated with the switches (on the controller front panel and the in-house pool panel) reflect the state of sweep demand. The SWEET BUTTON on the In-house panel operates in parallel with the button in the control box WHEN THE SECURITY SWITCH IS OFF. The in-house SWEET BUTTON is disabled when the SECURITY switch is ON.

The CIRCulation pump is always ON when the SWEET PUMP is ON. The controller automatically satisfies this criteria and provides a prime cycle to the SWEET pump (see Automatic Sweep Pump Priming in the Features section above).

The SWEET pump will not run if a FLUSH CYCLE is active. If the CIRCulation pump is already running when the SWEET button is pressed and the FLUSH CYCLE has completed, the SWEET pump will come ON immediately, otherwise the SWEET pump will be held OFF (while the CIRC pump runs, providing prime) until FLUSH CYCLE terminates.

Accessory 2, 3, and 4: May be toggled ON/OFF at any time by pressing the appropriate momentary contact switch. When the SECURITY switch is ON all the accessories are locked OFF.

FLUSH CYCLE: 5 minutes. Holds SWEET, HEATER OFF. Disables PRESSure Switch, and Pump Sensor High Limit Trip functions.

Pump High Limit: Enabled whenever SWEET pump is running. Holds SWEET OFF when tripped.

Pressure Switch Trip: Enabled whenever CIRC pump is running. Holds HEATER, CIRC, and SWEET pumps OFF when tripped.

Missing Water Sensor Protection: Enabled. Shuts HEATER OFF.

Freeze Protection (PUMP TEMP SENSOR): Enabled. Turns CIRC ON.

Freeze Protection (WATER TEMP SENSOR): Enabled. Turns on CIRC and HEATER.

COOL Down CYCLE: 3 minutes. Holds CIRC pump ON after HEATER shuts OFF.

Thermostatic Heater Control: Heat demand is determined by the pool setpoint potentiometer mounted on the controller front panel. CIRC pump must be ON before heater may come ON. HEATER cannot come on during FLUSH CYCLE.

POOL STATE Output Logic:

CIRCulation Pump is ON when:

PRESSURE Switch TRIP is NOT TRIPPED

-AND-

ONE OF THE FOLLOWING IS TRUE:

SWEET button is ON

-OR-

MAINTENANCE CYCLE is ACTIVE

-OR-

Freeze Protection (PUMP SENSOR) is ACTIVE

-OR-

Freeze Protection (WATER SENSOR) is ACTIVE

-OR-

COOL Down CYCLE is ACTIVE

JET Pump is OFF

BLOWER is OFF

ACCEssory 2 is ON if button is ON

HEATER is ON when:

PRESSURE Switch TRIP is NOT TRIPPED

-AND-

FLUSH CYCLE is NOT ACTIVE

-AND-

Missing Sensor is NOT ACTIVE

-AND-

POOL THERMOSTAT heat demand is ACTIVE

-AND-

AT ONE OF THE FOLLOWING IS TRUE (holding CIRC ON):

SWEET Button is ON

-OR-

MAINTENANCE CYCLE is ACTIVE

-OR-

Freeze Protection (WATER SENSOR) is ACTIVE

SWEET Pump is ON when:

PRESSURE Switch TRIP is NOT TRIPPED

-AND-

Pump HIGH LIMIT TRIP is NOT TRIPPED

-AND-

FLUSH CYCLE is NOT active

-AND-

SWEET button is ON

(Note the SWEET button may be ON due to maintenance cycle active in circ + sweep subcycle).

VALVE POWER is OFF

PRESSURE valve DIRECTION Relay is in POOL POSITION (OFF)

SUCTION valve DIRECTION Relay is in POOL POSITION (OFF)

ACC3 is ON when button is ON

ACC4 is ON when button is ON

LSYS (SYStem LED):

OFF = Normally

FLASH = Fault condition ACTIVE.

LHTR (HEATer LED):

ON = When heater relay (KHEAT) is CLOSED.

OFF = When heater relay is OPEN.

FLASH = Fault condition ACTIVE.

LSPA (SPA button LED):

ON, OFF = Displays status of SPA button.

FLASH = Fault condition ACTIVE

LSWP (SWEET button LED)

ON, OFF = Displays status of SWEET button.

FLASH = Fault condition ACTIVE

LVPOS (Valve POSITION LED)

OFF = Normally (in POOL STATE)

FLASH = Fault condition ACTIVE

LACC3 (ACC3 Button LED's) is ON if relay is CLOSED

LACC4 (ACC4 Button LED's) is ON if relay is CLOSED

C. POOL-COOL STATE

When the SYStem button is pressed from the POOL STATE, all control outputs are turned OFF (except the CIRC pump). The COOL CYCLE timer is set for a 5 minute cycle and the system advances to the POOL-COOL STATE.

The SWEEP button & LED retain the same status they had in POOL STATE upon leaving the state, even though the SWEEP pump itself is OFF (i.e. the SWEEP button/LED reflects the status of sweep DEMAND - not sweep PUMP).

During the POOL-COOL STATE, the system is run through a full 5 minute COOL CYCLE REGARDLESS of whether the heater had been ON prior to pressing the SYStem button (unless PRESSURE Switch TRIP is active - see next paragraph). This response was selected so that the delay between pressing the SYStem button and achieving SPA-ON STATE is constant regardless of heater status in the POOL STATE.

If a PRESSURE Switch TRIP is active in POOL STATE when the SYStem button is pressed, the system will skip the POOL-COOL STATE altogether and advance directly to VALVE CYCLE.

The operator may abort the POOL-COOL STATE and return the system to POOL STATE by pressing the SYStem button once the POOL-COOL STATE has been entered. If POOL-COOL STATE is aborted, the COOL CYCLE will continue to run when the system is returned to POOL STATE.

Freeze Protection (EITHER SENSOR): Fault displayed, no action taken.

Missing WT Sensor: Fault displayed, no action taken.

POOL-COOL STATE Output Logic:

CIRCulation pump is ON when:

COOL CYCLE is active (entire STATE duration)

JET pump is OFF

BLOWer (ACC1) is OFF

Accessory 2 is ON if ACC2 button is ON

HEATER is OFF

SWEEP pump is OFF

VALVE POWER is OFF

PRESSURE outlet VALVE DIRECTION = POOL (OFF)

SUCTION inlet VALVE DIRECTION = POOL (OFF)

Accessory 3 is ON if ACC3 button is ON

Accessory 4 is ON if ACC4 button is ON

LSYS (SYSTEM button LED):

ON = Normal for POOL-COOL STATE
FLASH = Fault condition ACTIVE

LHTR (HEATER ON LED):

OFF = Normal for POOL-COOL STATE
FLASH = Fault condition ACTIVE

LSPA (SPA button LED):

ON, OFF = Reflects status of SPA button
FLASH = Fault condition ACTIVE

LSWP (SWEEP button LED):

ON, OFF = Reflects the status of SWEEP Button
FLASH = Fault condition ACTIVE

LVPOS (Valve POSITION LED):

OFF = Valves are in POOL position
FLASH = Fault condition ACTIVE

LACC3 (Accessory 3 LED) is ON if ACC3 button is ON

LACC4 (Accessory 4 LED) is ON if ACC4 button is ON

D. VALVE CYCLE STATE

VALVE CYCLE STATE includes logic (program code) to rotate first one then the other valve from POOL to SPA or SPA to POOL position. The order of the valve rotation is important in case a valve fails (i.e. gets stuck part way through rotation). The rotation sequence guarantees water is drawn from the larger vessel (POOL) and directed into the smaller vessel (SPA) whenever the valves are in transition. If a valve fails the CIRC pump is turned on but will not be run dry.

VALVE Rotation Sequence : SPA TO POOL

- 1) SUCTION INLET valve moved first
- 2) PRESSURE OUTLET valve moved last

VALVE Rotation Sequence : POOL TO SPA

- 1) PRESSURE OUTLET valve moved first
- 2) SUCTION INLET valve moved last

The VALVE CYCLE consists of the following steps:

VALVE CYCLE

- 1) Turn OFF all PUMPS & HEATER (done in POOL-COOL or SPA-COOL).
- 2) Set VALVE DIRection relays to first step in rotation sequence (see above).
- 3) CLOSE VALVE POWER relay.
- 4) WAIT 1.5 sec for relays to actuate and current to start.
- 5) WAIT until valve actuator reaches limit switch or 1 minute, whichever is less. If valve does not reach limit switch within 1 minute go to VAVLE FAIL (see below).
- 6) OPEN VALVE POWER Relay.
- 7) Set VALVE DIRection relays to last step in rotation sequence (see above)
- 8) CLOSE VALVE POWER relay.
- 9) WAIT 1.5 sec for relays to actuate and current to start.
- 10) WAIT until valve actuator reaches limit switch or 1 minute, whichever is less. If valve does not reach limit switch within 1 minute go to VAVLE FAIL (see below).
- 11) OPEN VALVE POWER Relay.
- 12) Turn OFF drive to VALVE DIRection realys.
- 13) ADVANCE system state to SPA-ON or POOL STATE.

VALVE FAIL Response

- 1) OPEN VALVE POWER & DIRECTION control Relays.
- 2) LOAD FLUSH CYCLE Timer for 3 minute cycle.
- 3) Turn ON CIRC pump.
- 4) Set LED's: SYS, SPA, HTR, SWP, LVPOS flashing ON/OFF at the fault rate.
- 5) Display "6" is SUCTION VALVE failed; "7" PRESSURE VALVE failed on diagnostic panel fault display.

Freeze Protection (EITHER SENSOR): Fault displayed, no action taken.

Missing WT Sensor: Fault displayed, no action taken.

VALVE CYCLE Output Logic:

CIRCulation Pump is ON when:

PRESSURE Switch TRIP is NOT TRIPPED
-AND-
VALVE FAIL has TRIPPED

JET Pump is OFF

BLOWER (ACC1) is OFF

ACCEssory 2 is ON if ACC2 button is ON

HEATer is OFF

SWEET Pump is OFF

VALVE POWER relay - See definition of VALVE CYCLE above

PRESSURE OUTLET Valve DIRECTION Relay - see def. above

SUCITON INLET Valve DIRECTION Relay - see def. above

ACCEssory 3 is ON if ACC3 button is ON

ACCEssory 4 is ON if ACC4 button is ON

LSYS (SYStem button LED):

ON = VALVE CYCLE direction POOL → SPA
OFF = VALVE CYCLE direction SPA → POOL
FLASH = Fault condition active

LHTR (HEATER ON LED):

- OFF = Normal for VALVE CYCLE STATE
- FLASH = Fault condition ACTIVE

LSPA (SPA button LED):

- ON, OFF = Reflects status of SPA button
- FLASH = Fault condition ACTIVE

LSWP (SWEEP button LED):

- ON, OFF = Reflects status of SWEEP button
- FLASH = Fault condition ACTIVE

LVPOS (VALVE POSITION LED):

- ON = During VALVE CYCLE, direction SPA → POOL
- OFF = During VALVE CYCLE, direction POOL → SPA
- FLASH = Fault condition ACTIVE

LACC3 (Accessory 3 LED) is ON if ACC3 button is ON

LACC4 (Accessory 4 LED) is ON if ACC4 button is ON

E. SPA-ON STATE

The system will automatically advance after successfully completing the VALVE CYCLE STATE to SPA-ON STATE. The logic controlling the SPA-ON STATE is based roughly on operation of Catalina's RC4 product.

In SPA-ON STATE, the CIRCULATION pump is always ON, the JET pump, BLOWer, ACCessory 2, 3, and 4, may be ON or OFF depending on the status of their control buttons.

SPA (panel select) Button is discussed generally in section "A" above. The following table summarizes SPA Button operations specifically for SPA-ON STATE:

Summary of SPA Button Operation (SPA-ON STATE)

Panel Type	SPA Button	BLOWer Button	JET Button	ACC2 Button	SYS Button	THERMO Active
Master Spaside	OFF -	- OFF	- OFF	Enabled Enabled	Enabled Disabled	Yes No
Master Spaside	ON -	- Enabled	- Enabled	Enabled Enabled	Enabled Enabled	No Yes

2 PUMP OPTION: If a separate JET pump is used, this option foil trace program input must be PUNCHED-OUT to set-up logic to allow CIRC and JET pumps to run SIMULTANEOUSLY. (2.PUMP OPTION is NOT PUNCHED-OUT for systems using the high-speed of a 2 speed pump for JET. The 2 speeds of a 2 speed pump are run MUTUALLY EXCLUSIVELY).

FLUSH CYCLE: Since FLUSH CYCLE is initiated by turning on the CIRC and/or JET pump from a state where both were OFF, and since the CIRC pump runs continuously in SPA-ON STATE, a 5 minute FLUSH CYCLE is run once when the system enters the SPA-ON STATE.

PRESSure Switch TRIP: holds CIRC, JET, Heater OFF. Function is active if PRESSure switch OPENS after FLUSH CYCLE completes.

Missing Water Temp. Sensor: Whenever active holds heater OFF.

Freeze Protection (PUMP SENSOR): Turns ON CIRC pump (and JET pump, if 2 PUMP OPTION is active) when active.

Freeze Protection (WATER TEMP. SENSOR): Turns ON CIRC pump (and JET pump, if 2 PUMP OPTION is active). Allows HEATER to come ON if Freeze condition persists after FLUSH CYCLE.

COOL Down CYCLE: 5 minutes of CIRC pump after HEATER relay OPENS.

SYStem Button Automatic time-out Off: SYStem button will automatically time-out OFF 1 hour after the system enters the SPA-ON STATE. If the SYStem button times out, the system will automatically advance states to SPA-COOL STATE.

SPA-ON STATE Output Logic:

CIRCulation Relay is CLOSED when:

PRESSURE Switch TRIP is NOT TRIPPED
-AND-
AT LEAST ONE IS TRUE:

JET Button is NOT ON
-OR-
2 PUMP OPTION is ACTIVE

JET Relay is CLOSED when:

PRESSURE Switch TRIP is NOT TRIPPED
-AND-
AT LEAST ONE IS TRUE

JET Button is ON
-OR-
FREEZE PROTECTION is ACTIVE -AND- 2 PUMP
OPTION is ACTIVE

BLower is ON if BLower button is ON

ACcessory 2 is ON if ACC2 button is ON

HEATER is ON when:

PRESSURE Switch TRIP is NOT TRIPPED
-AND-
FLUSH CYCLE is NOT ACTIVE
-AND-
MISSING WATER SENSOR detection is NOT ACTIVE
-AND-
ONE OF THE FOLLOWING IS TRUE:

SPA Button is ON -AND- SPASIDE THERMOSTAT
DEMANDS HEAT
-OR-
SPA Button is OFF -AND- MASTER THERMOSTAT
DEMANDS HEAT

SWEET Pump is OFF

VALVE POWER is OFF

PRESSURE VALVE DIRECTION relay drive is OFF

SUCTION VALVE DIRECTION relay drive is OFF

ACCEssory 3 is ON if ACC3 Button is ON

ACCEssory 4 is ON if ACC4 Button is ON

L_{SYS} (SYStem Button LED):

ON = Normally for SPA-ON STATE
FLASH = Fault condition active

L_{HTR} (HEATer ON LED):

ON = HEATer Relay contacts are CLOSED
OFF = HEATer Relay contacts are OPEN
FLASH = Fault conditon ACTIVE

L_{SPA} (SPA Button LED):

ON, OFF = Reflects status of SPA Button
FLASH = Fault condition ACTIVE

L_{SWP} (SWEEP Button LED):

ON, OFF = Reflects status of SWEEP Button
FLASH = Fault condition ACTIVE

L_{VPOS} (Valve POSition LED):

ON = Normally in SPA-ON STATE
FLASH = Fault condition ACTIVE

LACC3 (ACCEssory 3 LED) is on if ACC3 button is ON

LACC4 (ACCEssory 4 LED) is on if ACC4 button is ON

F. SPA-CLEAN (SPA-CLN) STATE

Pressing the SYStem button from SPA-ON STATE will cause the system to advance to SPA-CLEAN STATE. SPA-CLEAN is essentially a 35 minute COOL CYCLE, that provides extra filtration of the spa water while the heater is cooled. The SPA-CLEAN STATE may be aborted by pressing the SYStem button before the timer times-out.

The SYStem LED will flash at the "clean flash" rate of .2 seconds ON / 4.5 seconds OFF while the system is in SPA-CLN STATE. Manual or automatic termination (time-out) of the state is indicated by the SYStem LED going ON steadily for 1.5 seconds and then going OFF.

SPA-CLEAN STATE Output Logic:

CIRCulation PUMP is ON when:

PRESSURE Switch TRIP is NOT TRIPPED

JET Pump (or speed) is OFF

BLOWER (ACC1) is OFF

ACCEssory 2 is ON if ACC2 Button is ON

HEATER is OFF

SWEET Pump is OFF

VALVE POWER is OFF

PRESSURE VALVE DIRECTION relay drive is OFF

SUCTION VALVE DIRECTION relay drive is OFF

ACCEssory 3 is ON if ACC3 Button is ON

ACCEssory 4 is ON if ACC4 Button is ON

L SYS (SYStem Button LED):

FLASH = CLEAN FLASH rate for normal operation
FLASH = Fault condition active (fast flash)

LHTR (HEATER ON LED):

OFF = Normally
FLASH = Fault conditon ACTIVE

LSPA (SPA Button LED):

ON, OFF = Reflects status of SPA Button
FLASH = Fault condition ACTIVE

LSWP (SWEET Button LED):

ON, OFF = Reflects status of SWEET Button
FLASH = Fault condition ACTIVE

LVPOS (Valve POSITION LED):

ON = Normally in SPA-CLN STATE
FLASH = Fault condition ACTIVE

LACC3 (ACCessory 3 LED) is on if ACC3 button is ON

LACC4 (ACCessory 4 LED) is on if ACC4 button is ON

G. SPA-COOL STATE

The system may enter SPA-COOL STATE by time-out from SPA-ON STATE, by time-out from SPA-CLN STATE, or by pressing the SYSTEM button from SPA-CLN STATE.

The SPA-COOL STATE is a "wait state" that allows the COOL CYCLE timer to complete its function before advancing states to VALVE CYCLE STATE (and return to POOL STATE). If the COOL CYCLE Timer is NOT ACTIVE when the SPA-COOL STATE is entered, the system immediately advances to VALVE CYCLE STATE.

It may be noted that the SPA-COOL STATE is actually redundant if it is entered by time-out from the SPA-CLN STATE. The fact that the SPA-COOL STATE is only active as long as the COOL CYCLE timer is active, and that the COOL CYCLE, by definition, had timed-out causing the advance of system state, causes the SPA-COOL STATE to become transparent since the system passes through it immediately.

SPA-COOL STATE Output Logic:

CIRCulation PUMP is ON when:

PRESSURE Switch TRIP is NOT TRIPPED .

JET Pump (or soeed) is OFF

BLOWer (ACC1) is OFF

ACCessory 2 is ON is ACC2 Button is ON

HEATER is OFF

SWEEP Pump is OFF

VALVE POWER is OFF

PRESSURE VALVE DIRection relay drive is OFF

SUCTION VALVE DIRection relay drive is OFF

ACCEssory 3 is ON . / ACC3 Button is ON

ACCEssory 4 is ON . / ACC4 Button is ON

LSYS (SYStem Button LED):

OFF = Normally

FLASH = Fault condition active (fast flash)

LHTR (HEATER ON LED):

OFF = Normally

FLASH = Fault conditon ACTIVE

LSPA (SPA Button LED):

ON, OFF = Reflects status of SPA Button

FLASH = Fault condition ACTIVE

LSWP (SWEETP Button LED):

ON, OFF = Reflects status of SWEETP Button

FLASH = Fault condition ACTIVE

LVPOS (Valve POSITION LED):

ON = Normally in SPA-CLN STATE

FLASH = Fault condition ACTIVE

LACC3 (ACCEssory 3 LED) is on if ACC3 button is ON

LACC4 (ACCEssory 4 LED) is on if ACC4 button is ON

H. TEST STATE

TEST STATE is entered from POOL STATE by rotating the Maintenance Cycle Select switch to position "O" which immediately initiates an automatic Relay / Diagnostic Display Test. Once the system is in TEST STATE, the function of each momentary contact switch, system LED, and thermostat may be ascertained using the Button and Thermostat Test features.

The next sections contain details on the three built-in system tests and a cautionary note on returning the system to POOL STATE.

Automatic Relay Sequence / Diagnostic Display Test

The automatic test sequence performs the following cycle, 9 times starting with sequence number 1:

- 1) WRITE Sequence number (1-9) to Fault Display.
- 2) CLOSE Relay associated with sequence number.
- 3) WAIT for 2 seconds.
- 4) BLANK Fault Display.
- 5) OPEN Relay associated with sequence number.
- 6) WAIT for .3 seconds.
- 7) ADVANCE Sequence number by 1

- 8) REPEAT 1) through 7), 9 times.

Each relay in the sequence has an associated LED on the Diagnostic panel that turns ON when drive to that relay is ON. By placing a multimeter across the relay output terminals and observing the status of the Fault Display, the drive-status-indicating LED's, and the reading on the meter, failures in the controller, display, relay driver, or relay may be deduced. The test may be repeated by returning to POOL STATE and re-entering TEST STATE (cycling the rotary switch out of "0" position and back again).

Relay Test Sequence

Seqn No.	Label	Relay Function
1	KCIRC	Circulate Pump (or low speed)
2	KJET	Spa Jet Pump (or high speed)
3	KBLOW	Spa Blower / ACCessory 1
4	KACC2	Spa Light / ACCessory 2
5	KHEAT	Heater pilot-duty relay
6	KSWP	Pool Sweep/booster/cleaner pump
7	KVPWR	Valve Power On/Off relay
8	KVBLW	Pressure Outlet Valve Direction Control
9	KVSCK	Suction Inlet Valve Direction Control

Note relays ACC3 & ACC4 are not switched in the self test sequence (but are directly controlled by the ACC3/4 momentary contact switches).

Momentary Contact Switch / LED Test

Each Momentary switch in the system may be pressed (individually) with the following results:

JET, ACC1 (BLOWer), ACC2, SYS (Spaside and master) Buttons:
Each time a button is pressed the SYStem LED will toggle state.

SPA Button: Pressing the SPA Button will cause the SPA LED to toggle state.

SWEET (In-house and controller) Buttons: Pressing will toggle the SWEET LED state.

ACC3 Button: Pressing will toggle ACC3 LED AND RELAY STATE.

ACC4 Button: Pressing will toggle ACC4 LED AND RELAY STATE.

SHORTED SWITCH TEST: The system will only allow one switch input be active at a time. If any 2 inputs change state simultaneously all LED's (except ACC3 and ACC4) will be set flashing ON/OFF at the fault flash rate. The system must be cycled out of TEST STATE to reset the flashing LED's in the event a shorted switch input is detected.

Thermostat / Heater LED Test

Perform the following steps (note the Master panel thermostat is optional):

- 1) Measure system water temperature with a thermometer.
- 2) Set Spaside, Master and Pool temperature setpoint potentiometers to minimum temperature.

VERIFY: That if the thermostat settings are colder than the water temperature, the HTR (Heater) LED is OFF.

- 3) Turn up one of the 3 thermostat pot's until the HTR (Heater) LED turns ON:

VERIFY: The temperature read from the scale position of the thermostat knob corresponds with the measured water temperature.

- 4) Turn down thermostat referred to in step 3).

VERIFY: The HTR LED goes OFF when the knob position is colder than the measured water temperature.

- 5) REPEAT steps 3) & 4) for each of the other 2 thermostats.

CAUTIONARY NOTE ON EXITING TEST STATE

The processor will read the value of the rotary switch AT THE INSTANT THE TIMECLOCK CONTACTS CLOSE to determine the duration of the circulate-only maintenance subcycle, or AT THE INSTANT THE FIRST SUBCYCLE TIMES-OUT to determine the duration of the circ + sweep subcycle.

If the position of the rotary switch is being changed at the instant the processor reads it (such as when the system is being switched from TEST to POOL STATE), a maintenance cycle other than the one intended may be initiated.

If this should happen, the rotary switch should be adjusted to the desired setting, then the RESET button on the diagnostic panel should be pressed to re-start the microprocessor and cancel the erroneous maintenance cycle.

The Walker Law Firm

A PROFESSIONAL CORPORATION

Joseph A. Walker
Attorney at Law

February 14, 1996

Timothy S. Westby
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VIA FACSIMILE ONLY
713/238-8008

RE: **BALBOA/SIEGE INDUSTRIES**
Your letter of February 7, 1996
Our File No. 1532-9

Dear Mr. Westby:

I have reviewed your letter of February 7, 1996. Specifically, I note, in your first paragraph concerning information you wish to disclose to the U.S. Patent and Trademark Office, that you have failed to designate anything specifically. Therefore, due to the lack of any specificity in your letter, Balboa Instruments, Inc. at this time must object to the providing of any information to the Patent Examiner. Balboa, therefore, deems that all the testimony and documents disclosed at the depositions remain Confidential and covered by the Protective Order. We would certainly be willing to re-review a request when the request contains specific documents and specific testimony that will allow us to make an intelligent decision.

In your second paragraph, you draw the conclusion that "many of the documents fall within the exclusions listed in paragraph 15(a) of the Protective Order". Again, you have left us with no choice but to inform you that we cannot agree to accept or reject the challenge you are making pursuant to paragraph 11. Paragraph 11 requires that we substantiate the basis for a designation within seven days. However, if you will not designate for us which documents you believe are covered by the exclusions listed in paragraph 15(a), we cannot substantiate our claim of Confidential.

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Timothy S. Westby
CONLEY, ROSE & TAYON
February 14, 1996
Page -2-

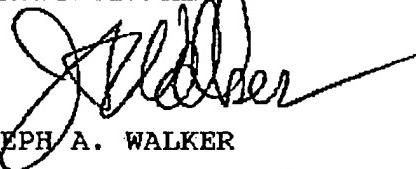
As I am sure you are aware, there were many documents produced at those depositions. Your failure to specifically itemize the documents that you believe to be excluded, makes your challenge under paragraph 11 a non-challenge. Balboa cannot substantiate its basis for designation unless it knows exactly what documents you wish to challenge. Therefore, Balboa continues to maintain the position that all documents and all testimony produced at the depositions remain Confidential. Balboa further informs you that your challenge pursuant to paragraph 11 is ineffective due to the failure to designate, specifically, the documents that you wish to have excluded.

Again, as I have set forth above, if you will designate with specificity those documents that you feel fall within the exclusions listed in paragraph 15(a) of the Protective Order, we will respond properly and promptly within the seven days designated in paragraph 11 to substantiate the basis for the designation of Confidential or to waive the designation of Confidential, as to specific documents.

I further note that the Protective Order requires the parties to resolve the dispute in good faith on an informal basis. This is the reason for my request for specificity. If we know specifically what documents and testimony you are concerned about, it is much more likely that the good faith resolution can be reached on an informal basis.

Very truly yours,

THE WALKER LAW FIRM
A PROFESSIONAL CORPORATION



JOSEPH A. WALKER

JAW/dla

cc: Robert Curfiss (via facsimile)
Richard Bardin (via facsimile)
Client (via facsimile)

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Joseph A. Walker
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February 16, 1996

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VIA FACSIMILE ONLY
713/238-8008

RE: BALBOA/SIEGE INDUSTRIES
Your letter of February 16, 1996
Our File No. 1532-9

Dear Mr. Westby:

My second review of the agreed Protective Order, done at your request indicates that the first step requires the application of paragraph 2. The last sentence in paragraph 2 states:

"In the event that such a reservation of right is made on the record, the parties shall treat all testimonies confidential from at least thirty (30) days from the date of the transmission of the deposition transcripts".

The information I have indicates that the deposition transcripts were transmitted to the parties in this matter on January 24, 1996. (See attached letters of January 24, 1996) Thirty days from that date is February 23, 1996. Thus, the testimony and the documents attached to those depositions, by agreement, is to remain confidential for a minimum of 30 days from the 24th. Therefore, the requests you have been making in your letters, prior to your letter of February 15, 1996 and in your letter of February 15, 1996, are premature.

The next portion of the Agreed Protective Order to review is paragraph 15(b). It states:

"In the event that any designation of testimony, documents or other matters as Confidential is or becomes inconsistent with the terms of this paragraph, such designation shall be honored by the parties until amended by agreement among the parties or until reviewed by this Court in accordance with the provisions of paragraph 11 of this Order."

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Thus, your assertion that Balboa has an affirmative duty to "not" designate is incorrect. Balboa so designated at the deposition that the transcripts and the documents produced, were Confidential. You are challenging that designation under paragraph 15(a). If you wish to do so properly, we must then go to paragraph 11. It is not Balboa's affirmative duty to "not" to designate. It appears to be Siege's requirement to request a non-designation or un-designation under paragraph 11.

Paragraph 11, in part, states:

"If the dispute cannot be resolved, the party seeking to preserve confidentiality shall seek appropriately from the court within ten (10) days after receiving a written request from the opposing party. Such a written request shall identify specifically the information and documents to which the request pertains."

It is not my intention to play games or misconstrue the Agreed Protective Order. It is in my client's best interest, however, to request that you follow the terms of that Agreed Protective Order. My reading of paragraph 11 says that you shall identify "specifically" the information and documents. Although I was not at all of the depositions, it is my understanding that all exhibits were numbered or identified by letter such that they could easily be identified by you to me, so that I can review with my client whether or not we wish to maintain the Confidential status. The same applied to the deposition testimony. If there are portions that you wish to use by page and line, please identify those so I can review the same with my client.

The deposition testimony given by Ms. Otto and Mr. Pinkul is definitely Confidential and not in the public domain. Thus, they were giving their opinions and recollections on the development of proprietary products belonging to Balboa Instruments, Inc. Therefore, unless you can specifically identify for me which portions of testimony you wish to forward to the patent office, we cannot make an intelligent assessment of whether or not we wish to release the Confidential designation.

What I suggest is that you take a few moments to review the transcripts and the documents and inform me, as soon as you wish after the 23rd of February, as to specifically which documents, as they were identified in the depositions, you wish to be released from the Confidential designation and which specific portions of testimony you wish to have released from the Confidential designation. I will immediately consult with my client and

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February 16, 1996
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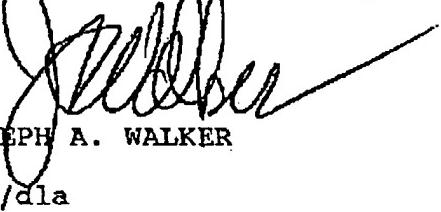
promptly respond as to whether or not it wishes to release the Confidential designation. If we do not wish to release the Confidential designation, we will substantiate the basis for the designation of Confidential to remain.

I am sure I will hear from you shortly after the 23rd of February. Please at that time, be specific. We will promptly and properly respond pursuant to the terms of the agreed Protective Order.

Of course, if you have any questions in the meantime, please feel free to contact me by telephone

Very truly yours,

THE WALKER LAW FIRM
A PROFESSIONAL CORPORATION



JOSEPH A. WALKER

JAW/dla

cc: Robert Curfiss (via facsimile)
John Hanley (via fax)
Client (via facsimile)

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Direct Dial No.
(713) 238-8030

February 22, 1996

Mr. Joe Walker, Esq.
The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

VIA TELECOPY
714-752-0439

Re: *Siege Industries, Inc. v. Clark Manufacturing, Inc. et al.*
Civil Action No. H-94-3180 (S.D. Tex.)

Dear Mr. Walker:

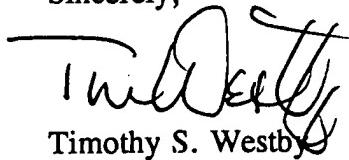
Regarding your letter of February 16, 1996 please note that Siege has complied perfectly with paragraph 2 of the Protective Order and we do not understand your letter to suggest otherwise. However, the last sentence of paragraph 2, to which you refer, applies only when a party has "reserve[d] on the record the right to designate portions of the deposition testimony as Confidential." This provision allows such a party 30 days to designate portions of deposition testimony as confidential. A party may thus choose to either make its designations on the record or reserve on the record the right to make them within 30 days. As you are undoubtedly aware, Balboa's counsel chose not to reserve Balboa's right to make designations within 30 days but to designate on the record the *entire* transcript and exhibits. Thus the 30 day waiting period to which you refer is not applicable. Any other interpretation renders paragraph 2 meaningless. Furthermore, even if the 30 day period did apply, the Protective Order imposes no waiting period on challenges to Confidential designations; indeed, such challenges may be made "at any stage in this lawsuit" including the time of designation. Accordingly, Siege's requests are not premature.

Although we disagree as to a duty to specifically identify information, Siege has in fact specifically identified the relevant information twice: "the entire transcript of the January 17, 1996 Balboa deposition and all exhibits thereto." We have also offered to limit the request as to time. Balboa insists that "*all the testimony and documents*" remain Confidential, and "*object[s] to the providing of any information to the Patent Examiner*." Siege cannot accept this position, especially when MPEP § 724.02 expressly allows submission of Proprietary information and materials Subject to Protective Order.

Without waiving its challenge to the confidentiality of any of the information, Siege requests that Balboa agree to submission of the deposition excerpts and exhibits listed on the attachment hereto to the United States Patent & Trademark Office. Note that deposition exhibit 115 was provided to us by Sundance. Be advised that any failure by Balboa to comply with paragraph 11 releases Siege from the Order. I trust that I will hear from you within seven days, during which time Siege will continue to treat the information as confidential.

February 22, 1996
Page 2

Sincerely,


Timothy S. Westby

Attachments

k:\siege\00100\ltr\walker.007

DEPOSITION EXCERPTS OF CINDY OTTO

P. 6, L. 15 - P. 6, L. 25

P. 7, L. 17 - P. 7 L. 18

P. 9, L. 12 - P. 13, L. 19

P. 14, L. 3 - P. 16, L. 16

P. 17, L. 4 - P. 19, L. 18

P. 19, L. 23 - P. 26, L. 5

P. 26, L. 21 - P. 29, L. 23

P. 30, L. 6 - P. 31, L. 8

P. 34, L. 3 - P. 34, L. 7

P. 36, L. 24 - P. 37, L. 13

P. 38, L. 4 - P. 38, L. 24

P. 43, L. 15 - P. 45, L. 20

P. 46, L. 18 - P. 48, L. 15

P. 48, L. 21 - P. 51, L. 6

P. 51, L. 13 - P. 51, L. 16

EXHIBITS

115, 160, 161, 164

DEPOSITION EXCERPTS OF ALLAN PINKUL

P. 8, L. 16 - P. 11, L. 25	P. 67, L. 16 - P. 80, L. 21
P. 13, L. 1 - P. 13, L. 10	P. 82, L. 22 - P. 91, L. 6
P. 13, L. 19 - P. 13, L. 23	P. 91, L. 25 - P. 94, L. 8
P. 14, L. 23 - P. 14, L. 24	P. 91, L. 18 - P. 101, L. 11
P. 16, L. 17 - P. 17, L. 11	P. 102, L. 8 - P. 104, L. 3
P. 18, L. 2 - P. 18, L. 18	P. 104, L. 14 - P. 107, L. 21
P. 19, L. 3 - P. 19, L. 16	P. 108, L. 22 - P. 109, L. 11
P. 23, L. 17 - P. 24, L. 4	P. 109, L. 25 - P. 112, L. 10
P. 24, L. 24 - P. 28, L. 5	P. 113, L. 25 - P. 115, L. 18
P. 28, L. 10 - P. 38, L. 1	P. 116, L. 4 - P. 117, L. 21
P. 38, L. 8 - P. 38, L. 10	P. 119, L. 14 - P. 119, L. 25
P. 38, L. 20 - P. 40, L. 12	P. 123, L. 7 - P. 131, L. 11
P. 40, L. 24 - P. 60, L. 8	P. 132, L. 3 - P. 134, L. 2
P. 63, L. 21 - P. 66, L. 20	

EXHIBITS

140, 141, 142, 145, 146, 147, 148, 152, 153, 154

The Walker Law Firm

A PROFESSIONAL CORPORATION

Joseph A. Walker
Attorney at Law

February 29, 1996

Timothy S. Westby
Conley, Rose & Tayon
Texas Commerce Tower
6000 Travis, Suite 1850
Houston, Texas 77002-2912

VIA FACSIMILE ONLY
713/238-8008

RE: SIEGE INDUSTRIES v. CLARK
Our File No. 1532-9

Dear Mr. Westby:

The purpose of this letter is to respond to your letter of February 22, 1996. You are raising several issues.

First, you have, finally, specifically designated exhibits and deposition testimony that you wish to have removed from the Confidential designation. Obviously, if information is removed from the Confidential designation, you can do with it as you wish.

Second, notwithstanding whether or not information is maintained as Confidential, you wish to disclose it to the USPTO. Presumably, this is a request to include the USPTO within the group of persons referenced in paragraph 3 of the Agreed Protective Order.

As for the Cindy Otto deposition transcript and documents, I agree with you that Exhibit 115 is not a document that Balboa can label Confidential. Therefore, Balboa has no opinion on whether this document should or should not remain Confidential.

Exhibits 160 and 161 are, and shall remain, Confidential for the purposes of this action. The information relates to proprietary products sold by Balboa. The documents do not appear to be covered by paragraphs 15(a) or 15(c) of the Agreed Protective Order. Therefore, the designation of Confidential shall remain.

Exhibit No. 164 is dated 7/1/86 between Balboa and Sundance. This was the Balboa-Sundance Sales Agreement. It has never been part of the public domain. Therefore, it does not appear to be an exception contained in paragraphs 15(a) or 15(c) of the Agreed Protective Order. Balboa, therefore, continues to designate this document as Confidential for the purposes of this action.

The Walker Law Firm

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Timothy S. Westby
CONLEY, ROSE & TAYON
February 29, 1996
Page -2-

You wish to remove the Confidential designation from numerous pages contained within the transcript of the deposition of Ms. Otto. First, let me remind you that in paragraph 6 of the "Stipulated Amendment to Agreed Protective Order, entered May 2, 1995", Siege Industries, Inc. and its attorneys agreed that all testimony and documents produced by Balboa in the action pursuant to subpoena shall be designated and treated as "Confidential". Obviously, the material contained at page 6, lines 15 through 25, and page 7, lines 17 and 18, indicating Ms. Otto's home address, employment and education may or may not be available in the public domain. In the interests of Ms. Otto's privacy, unless you can show that you can obtain this information by means other than the deposition of Ms. Otto, the Confidential designation should not be removed from that testimony. However, I will await your proof. If your proof is adequate, we will remove the Confidential designation to which you have previously stipulated.

The remaining testimony of Ms. Otto relates to her participation in the research, design, development, production and sale of proprietary products belonging to Balboa. Her knowledge does not fit within the exceptions contained in paragraphs 15(a) or 15(c). Therefore, Balboa continues to maintain that her testimony shall remain Confidential for the purposes of this action.

Turning to the Allan Pinkul deposition transcript and documents, I am in agreement with you that No. 140 should not be designated Confidential. It is the subpoena that was served on Mr. Pinkul to appear at his deposition and it appears to qualify as an exception under paragraph 15(a)(iii).

Documents numbered 142, 145, 146, 147, 148, 152 and 154 shall remain Confidential. These documents were created by Balboa for the research, design, development, production and sale of a proprietary product. The documents do not appear to fall within the exception set forth in paragraphs 15(a) or 14(c) of the Protective Order and therefore shall remain Confidential for the purposes of this action.

Document No. 153 is a report that Balboa had prepared for it by an outside engineer for the purpose of complying with FCC requirements. The information was filed with the FCC. Balboa will remove its Confidential designation if you can show that the document fits within the exception designated in paragraph 15(a), (iv). In other words, if Siege Industries, Inc. could have obtained this report from the FCC, then the document would not be confidential for the purposes of this action. If Siege Industries, Inc. could not obtain this document at any other place, other than

The Walker Law Firm

A PROFESSIONAL CORPORATION

Timothy S. Westby
CONLEY, ROSE & TAYON
February 29, 1996
Page -3-

directly from Balboa or the FCC, only with Balboa's permission, then Balboa will maintain the document as Confidential for the purposes of this action since the document does not fit within the exceptions of paragraphs 15(a) and 15(c).

Concerning the deposition testimony of Allan Pinkul, I have the same observation as I did about the Ms. Otto deposition. First of all, the information that you wish to have Confidential designation removed from at page 8, line 16 to page 11, line 25, is information that you have stipulated shall remain Confidential. However, if you can show that this information is in the public domain or you could have obtained it from some other source, then paragraph 15(a)(iv) would apply and Balboa will agree to have the Confidential designation removed. However, in the interest of maintaining Mr. Pinkul's privacy, unless you show that you could have obtained this information elsewhere, Balboa will continue to maintain the Confidential designation for the purposes of this action.

As to the remaining sections of deposition testimony of Mr. Pinkul, from which you wish to have the Confidential designation removed, Balboa will not remove the Confidential designation. Mr. Pinkul's testimony concerns the research, design, development, production and marketing of proprietary products of Balboa Instruments. Therefore, it does not appear to fall within the exceptions set forth in paragraphs 15(a) or 15(c) and Balboa will continue to maintain the Confidential designation for the purposes of this action.

Your request to send Confidential information to the USPTO is rejected. I see no provision in paragraph 3 of the Agreed Protective Order to add the USPTO to the list of people to whom Confidential information can be disclosed.

I also remind you of the contents of paragraph 4 of that Order which state:

"Confidential documents and information may be used in accordance with the terms of this Order solely for the limited purpose of preparing for and conducting the trial of this lawsuit." (emphasis added)

Balboa's representatives appeared pursuant to subpoena to provide information solely for the purpose of preparing for and conducting

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Timothy S. Westby
CONLEY, ROSE & TAYON
February 29, 1996
Page -4-

a trial in this lawsuit. These representative did not appear, and did not agree, to have their testimony or documentation produced to the USPTO, which is not a party to the action, and which does not appear to be a party disclosed in paragraph 3 of the Agreed Protective Order.

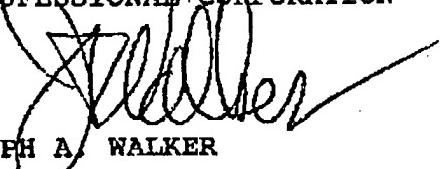
Additionally, it is to be noted that, due to the Protective Order, Siege is under no obligation, despite being subject to a duty of disclosure under 37 C.F.R. 1.56(a), to successfully file the Confidential materials and testimony of Balboa with the USPTO. On the contrary, Siege's duty would be fulfilled if they merely informed the USPTO that such information exists and that it is covered by a protective order. See Ball Corp. v. Xidex Corp., 967 F.2d 1440 (10th Cir. 1992) and Philip Morris, Inc. v. Brown & Williamson Tobacco, 641 F.Supp. 1438 (M.D.Ga. 1986).

Finally, if and when the lawsuit is finally concluded, all Confidential documents shall be returned to Balboa. You, on behalf of your client, may choose to raise the issue of submitting Balboa's Confidential information to the USPTO at that time. However, until this lawsuit is over, it is Balboa's contention that its Confidential information shall remain Confidential and shall not be disclosed other than as set forth in the Agreed Protective Order.

I trust this will resolve this issue until the conclusion of the lawsuit. If you have any questions in the meantime, please contact me at your convenience.

Very truly yours,

THE WALKER LAW FIRM
A PROFESSIONAL CORPORATION



JOSEPH A. WALKER

JAW/dla

cc: Robert Curfiss (via facsimile)
John Hanley (via facsimile)
Client (via facsimile)

INTELLECTUAL PROPERTY LAW
INCLUDING
PATENTS, TRADEMARKS,
COPYRIGHTS AND
UNFAIR COMPETITION

TIMOTHY S. WESTBY

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Direct Dial No.
(713) 238-8030

March 12, 1996

Mr. Joe Walker, Esq.
The Walker Law Firm
1301 Dove Street, Suite 450
Newport Beach, California 92660

VIA TELECOPY
714-752-0439

Re: *Siege Industries, Inc. v. Clark Manufacturing, Inc. et al.*
Civil Action No. H-94-3180 (S.D. Tex.)

Dear Mr. Walker:

We are in receipt of your correspondence of February 29, 1996 refusing to allow Siege Industries, Inc. to bring to the attention of the U.S. Patent and Trademark Office information in the possession of your client, Balboa, Inc., relating to the Balboa 700 Series spa control. Siege Industries, Inc. has applications pending before the U.S. Patent and Trademark Office which relate to U.S. Patent No. 5,361,215, the patent-in-suit in the above-referenced litigation. The defendant, Clark Manufacturing, Inc., has alleged in that litigation that the Balboa 700 Series is prior art. The position taken by Balboa in your correspondence of February 29 precludes our bringing to the attention of the U.S. Patent and Trademark Office the deposition testimony and related exhibits concerning the research, design, development, production, and sale by Balboa of the Balboa 700 Series spa control to allow the Examiner at the U.S. Patent and Trademark Office to consider whether the Balboa 700 Series is prior art and, if so, to consider the teachings of the Balboa 700 Series with respect to the patentability of the claims in those applications.

We do not know what Balboa's position is regarding the early design efforts on the Balboa 700 Series but apparently, Balboa does not want us to disclose these efforts and selected documents to the U.S. Patent and Trademark Office. If this is incorrect, please advise. We would like to give this information to the U.S. Patent and Trademark Office so that all art can be considered. It is in the best interests of Balboa, as a manufacturer of spa controls, to have all prior art considered by the U.S. Patent and Trademark Office in determining patentability. Balboa, however, is effectively preventing the U.S. Patent and Trademark Office from considering the Balboa 700 Series by claiming the information is confidential and protected from disclosure by the Protective Order.

At a minimum, please advise us on Balboa's position as to whether the Balboa 700 Series is prior art to the '215 patent? In addition, is it Balboa's position that the information set forth in the deposition transcripts and exhibits has been maintained confidential and, therefore, has never been accessible to the public?

March 12, 1996

Page 2

By Balboa's refusal to allow us to submit this information to the U.S. Patent and Trademark Office, we will have no alternative but to represent to the U.S. Patent and Trademark Office that Balboa has refused to allow us to submit this information for its consideration in determining the patentability of the claims in these pending applications. Please advise us on your position on this matter prior to March 18, 1996.

Sincerely,

Timothy S. Westby pwr

Timothy S. Westby

TSW/mac
k:\siege\00100\ltr\walker.008

The Walker Law Firm

A PROFESSIONAL CORPORATION

Joseph A. Walker
Attorney at Law

March 18, 1996

Timothy S. Westby
Conley, Rose & Tayon
Texas Commerce Tower
6000 Travis, Suite 1850
Houston, Texas 77002-2912

VIA FACSIMILE ONLY
713/238-8008

RE: SIEGE INDUSTRIES v. Clark
Your letter of March 12, 1996
Our File No. 1532-9

Dear Mr. Westby:

First of all, since I presume you are well schooled in the area of patent law, you have to know that my client has no idea about the applications pending before the U. S. Patent and Trademark Office which relate to U.S. Patent No. 5,361,215. Thus, my client has no independent ability to evaluate your client's necessity to disclose information that has been marked as "Confidential" in the above referenced civil action.

The second point that you should note is that my client, Balboa Instruments, Inc., is making no effort to prevent disclosure of any information concerning the above referenced civil action. As you well know, designated agents of Balboa appeared for depositions and produced evidence to which all parties stipulated would be covered by the Confidential designation set forth in the Agreed Protective Order. Balboa's position is, and has always been, that the information it disclosed pursuant to discovery is covered by the Confidential designation in the above referenced civil action.

The third point that you should note is that by your letter of March 12, 1996, you have indicated that there are other patent applications pending which "which relate to". These, by the admissions in your letter, obviously have nothing to do with the pending civil action. As such, the information subject to the Agreed Protective Order in the pending civil action is not something that relates to other "other applications...which relate to". Balboa considers those to be separate and distinct matters.

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March 18, 1996
Page -2-

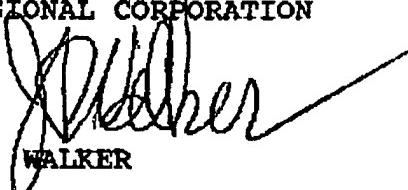
Your efforts to somehow twist Balboa's desire to follow the dictates of the Agreed Protective Order concerning discovery had against it in the above entitled civil action are not appreciated. Balboa believes that, as of this date, it has fully complied with discovery requests and expects all parties to the above entitled civil action to comply with the Agreed Protective Order. Balboa, at present, has no control over Siege applications "which relate to" the 215 patent. Since the discovery in the above entitled action only relates to the 215 patent and not to any other pending applications, the Agreed Protective Order, as the law of the case, governs the discovery.

Your question about prior art is directed to the wrong person. That question is one for Clark and/or the Court. Your question about public access is also mis-directed. Balboa has designated, per stipulation, its discovery in the above referenced civil action as Confidential. While the above referenced civil action is pending, it will maintain that stipulated designation. The Confidential designation is a creation of the above referenced civil action for the action itself. It did not exist prior to the action, but now exists per stipulation and will remain until the action concludes.

In conclusion, Balboa's discovery in the above entitled civil action shall remain subject to the Agreed Protective Order. If Siege wishes to use discovery from the above entitled civil action, that is subject to the Agreed Protective Order, in matters outside the above entitled civil action, Siege must either comply with Agreed Protective Order or obtain a stipulation from Balboa.

Very truly yours,

THE WALKER LAW FIRM
A PROFESSIONAL CORPORATION



JOSEPH A. WALKER

JAW/dla

cc: Robert Curfiss (via facsimile)
Craig Bailey (via fax)
Client (via facsimile)

OWNER'S MANUAL



"THE SYSTEM 110" SS110HBD FOR SPAS AND HOT TUBS

"THE SYSTEM" LIMITED WARRANTY

Sta-Rite Industries, Inc. ("Sta-Rite") warrants to the original consumer purchaser ("Purchaser") of products manufactured by it that they are free from defects in materials or workmanship.

If within TWENTY-FOUR (24) months from date of installation, the logic board should prove to be defective, it shall be repaired or replaced at Sta-Rite's option. If any other product shall prove to be defective within TWELVE (12) months from date of installation, it shall be repaired or replaced at Sta-Rite's option. Purchaser must pay all labor and shipping charges necessary to replace the product covered by this warranty. This warranty shall not apply to any product that has been subject to negligence, misapplication, improper installation or maintenance, or other circumstances beyond Sta-Rite's control.

Requests or service under this warranty shall be made by contacting the installing Sta-Rite dealer as soon as possible after the discovery of any alleged defect. Sta-Rite will subsequently take corrective action as promptly as reasonably possible. No requests for service under this warranty will be accepted if received more than 30 days after the term of this warranty.

This warranty sets forth Sta-Rite's sole obligation and purchaser's exclusive remedy for defective products.

STA-RITE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL OR CONTINGENT DAMAGES WHATSOEVER.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES. IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL NOT EXTEND BEYOND THE DURATION OF THE APPLICABLE EXPRESS WARRANTIES PROVIDED HEREIN.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above limitations or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

WATER EQUIPMENT DIVISION

STA-RITE INDUSTRIES, INC., DELAVAN, WISCONSIN 53115

NATIONWIDE CUSTOMER SERVICE: Santa Fe Springs, California • Orlando, Florida
Oklahoma City, Oklahoma • Chamblee, Georgia • Ledgewood, New Jersey

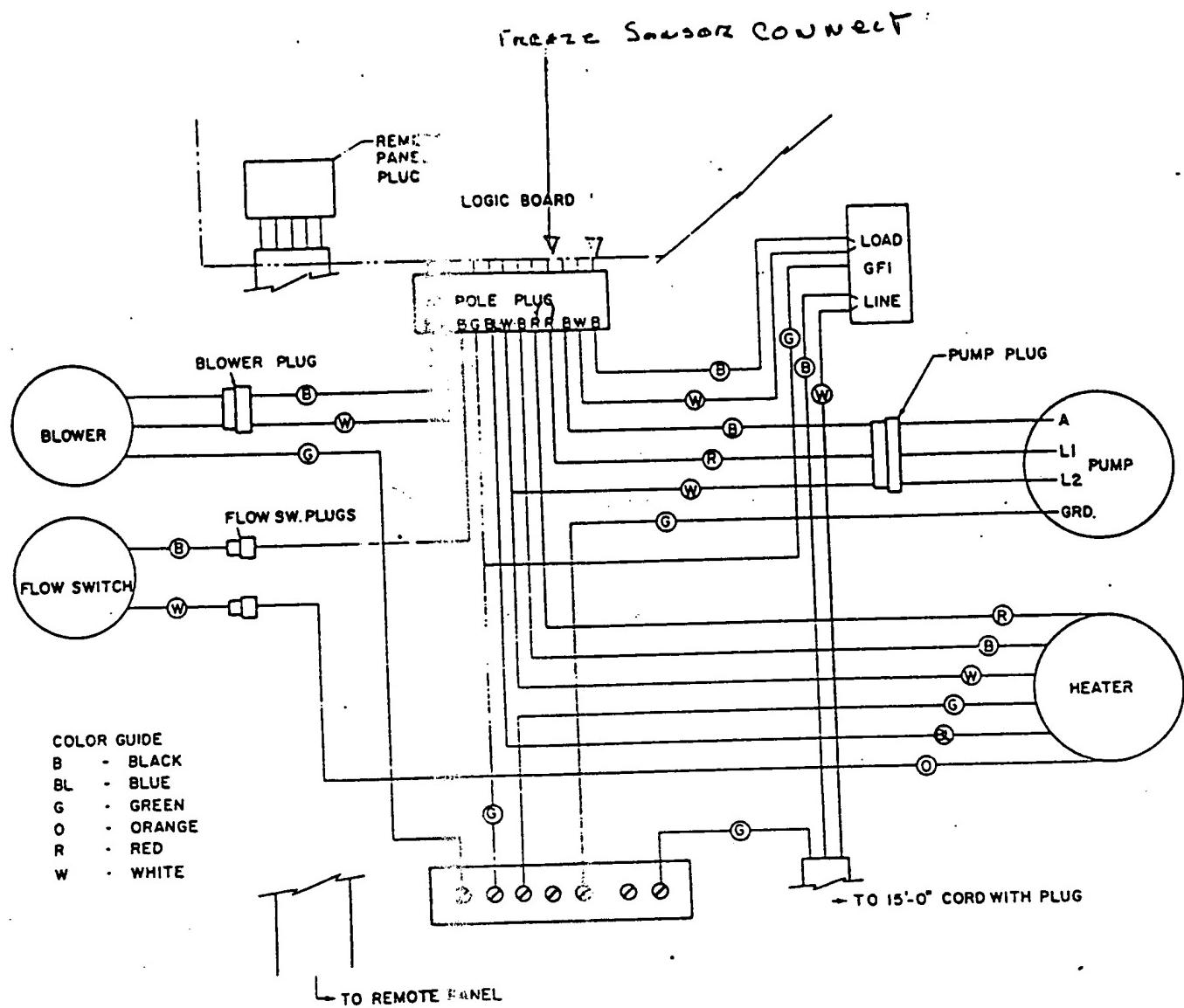


FIGURE 2

6. UNCRATING

"The System 110" is placed on a wooden skid for protection and ease of handling during shipment. The cardboard carton should be removed from around the skid prior to removing "The System 110" from the skid. Lift "The System 110" by the base only—DO NOT LIFT THE EQUIPMENT BY HOLDING ON TO THE PIPING! This could cause pipe leakage after installation and could cause damage to the equipment.

7. TYPICAL INSTALLATION DIAGRAM

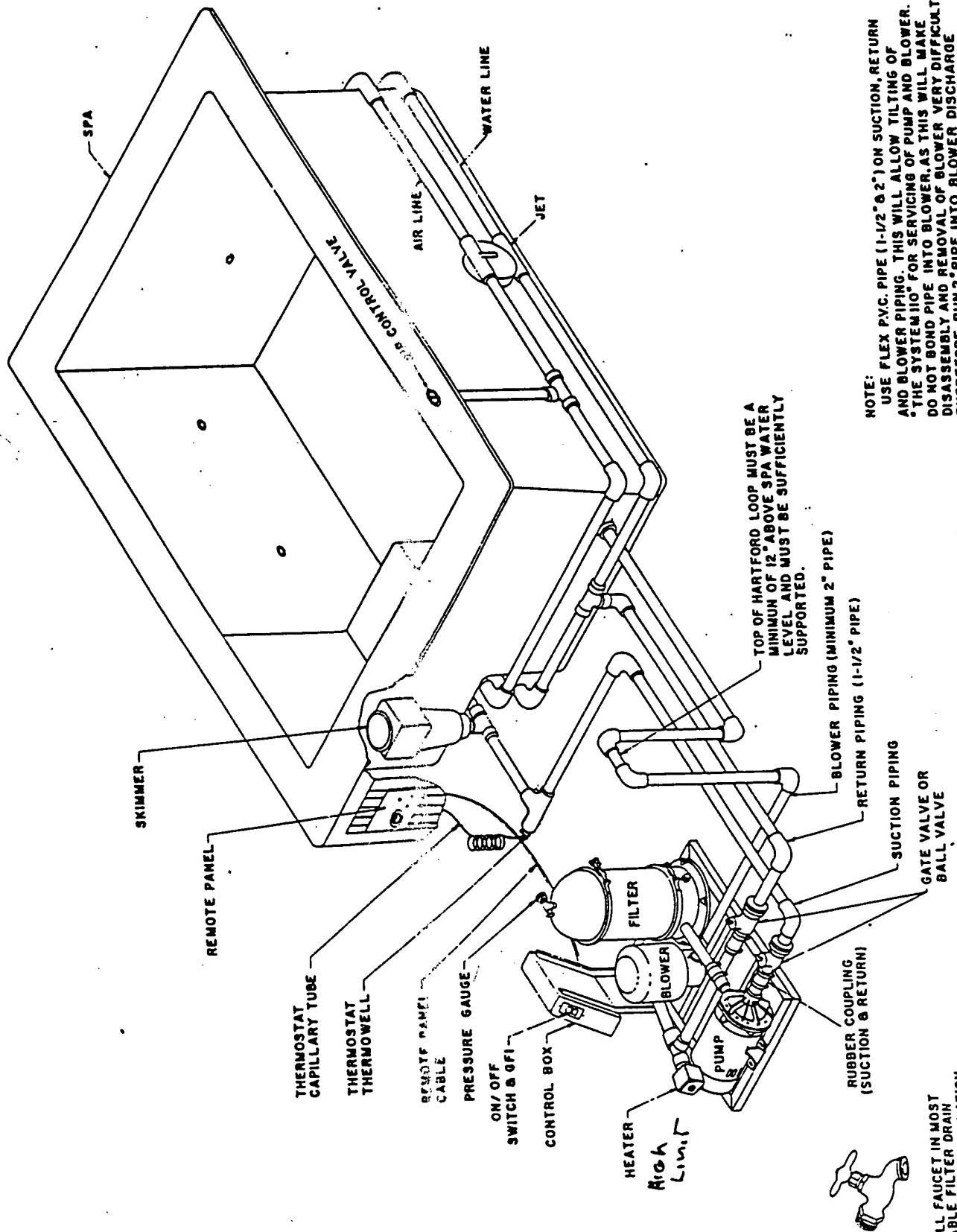


FIGURE 3

INSTALL FAUCET IN MOST SUITABLE FILTER DRAIN LOCATION, AT INSTALLATION.

012245
1187

INSTALLATION OF THERMOSTAT THERMOWELL IN SUCTION PIPING

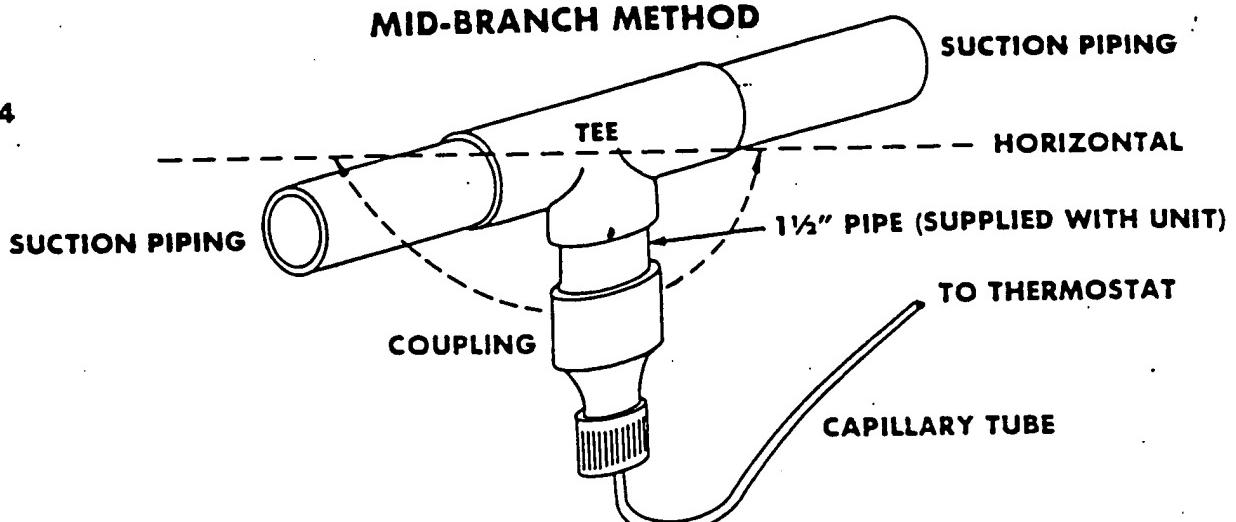
(USE MID-BRANCH METHOD WHENEVER POSSIBLE.
THIS WILL MINIMIZE EROSION OF THERMOWELL IN WATER STREAM).

IMPORTANT: BE SURE TO INSULATE TEE AND ALL PIPING WITHIN APPROXIMATELY 12" OF TEE TO
MINIMIZE HEAT LOSS. HIGH HEAT LOSS CAN CAUSE EXCESSIVE HEATER CYCLING.

DO NOT INSTALL TEE SUCH THAT MIDDLE BRANCH POINTS ABOVE HORIZONTAL THIS COULD
ALLOW SENSING BULB TO BE SURROUNDED BY AIR, CAUSING INACCURATE SENSING.

MID-BRANCH METHOD

FIGURE 4



END BRANCH METHOD

FIGURE 5

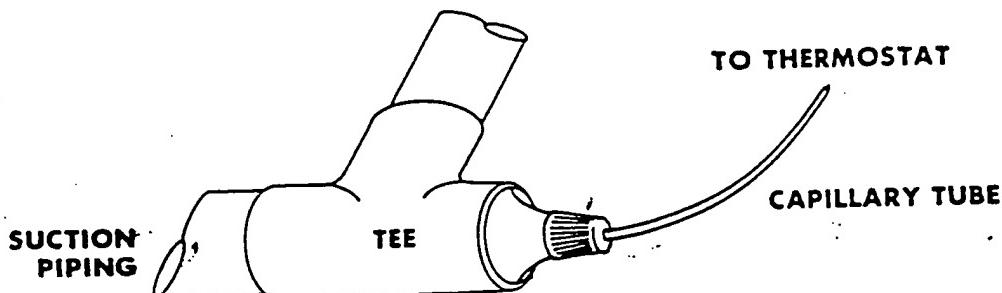
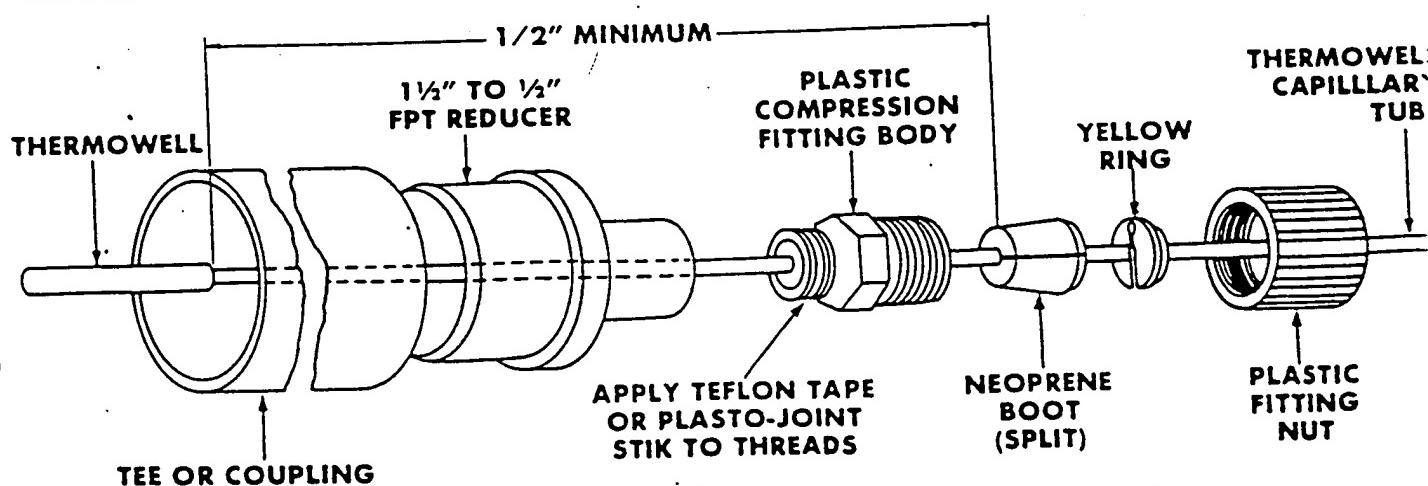


FIGURE 6

THERMOWELL INSTALLATION EXPLODED VIEW



10. AIR BLOWER PIPING

IT IS ESSENTIAL THAT THE AIR BLOWER PIPING BE AS FOLLOWS:

THE PIPE DIAMETER MUST NEVER BE LESS THAN 2". Use of smaller piping will void the blower warranty, severely restrict blower output, and cause excessive blower motor heat build-up. This condition would result in severely shortened service life of the blower and premature burn-out of the motor.

THE BLOWER RETURN PIPING MUST HAVE A "HARTFORD LOOP" CONSTRUCTED, which will extend a minimum of 12" over the highest possible water level in the spa/hot tub. This will prevent water from surging through the air piping and entering the motor windings of the air blower. This could cause severe electrical shock hazard to any people in the water, and would cause damage to the blower.

TOTAL PIPE LENGTH OF THE AIR RETURN LINE SHOULD NOT EXCEED 25 FT. Longer pipe runs will increase the restriction of blower output, cause higher blower operating temperatures, and decreased bubbling action in the spa/hot tub.

CAUTION: IF THE AIR BLOWER PIPE JOINTS ARE CEMENTED TOGETHER, THE GLUE JOINTS MUST CURE FOR AT LEAST 24 HOURS PRIOR TO TURNING ON THE BLOWER. Fumes from the glue could be contained in the piping, and the fumes are highly flammable. Electrical sparks from the blower motor could ignite the fumes, if they are not allowed to escape during the cure time.

It is recommended that the air piping not be cemented into the 2" discharge port on the blower, to allow easier service or replacement. A self-tapping screw is adequate to secure this connection.

CAUTION

TO ASSURE ELECTRICAL SAFETY IN SPAS/HOT TUBS EQUIPPED WITH AIR BLOWERS, IT IS RECOMMENDED THAT AIR BLOWERS BE PIPED ONLY INTO "AIR CHANNELS" WITH NUMEROUS DRILLED AIR HOLES. PIPING AIR BLOWERS INTO THERAPY JET FITTINGS CAN CAUSE WATER UNDER PRESSURE TO BACK-UP INTO THE AIR BLOWER IF SOME OR ALL OF THE JET FITTINGS ARE BLOCKED OFF BY BATHERS. THIS WILL CAUSE SERIOUS SHOCK HAZARD POTENTIAL.

11. CIRCUIT REQUIREMENTS

Plug "THE SYSTEM 110" into receptacle on a 20 amp, 115 volt grounded circuit only. Circuit must be isolated in such a way that no other electrical appliances and lights draw current from the circuit. **CAUTION: WE RECOMMEND THE USE OF A 20 AMP GROUND FAULT INTERRUPTER RECEPTACLE IN OUTLET TO PROTECT AGAINST SHOCK FROM CORD.** Consult a licensed electrician if a 20 amp., 115 volt current is not available. **DO NOT USE EXTENSION OR DROP CORD.**

Do not locate cord where physical damage could occur to it. If cord must be placed in a heavily traveled area, protect it from wear and fraying, which could cause a shock hazard. **PROTECT ELECTRICAL CORD FROM COMING IN CONTACT WITH WATER.**

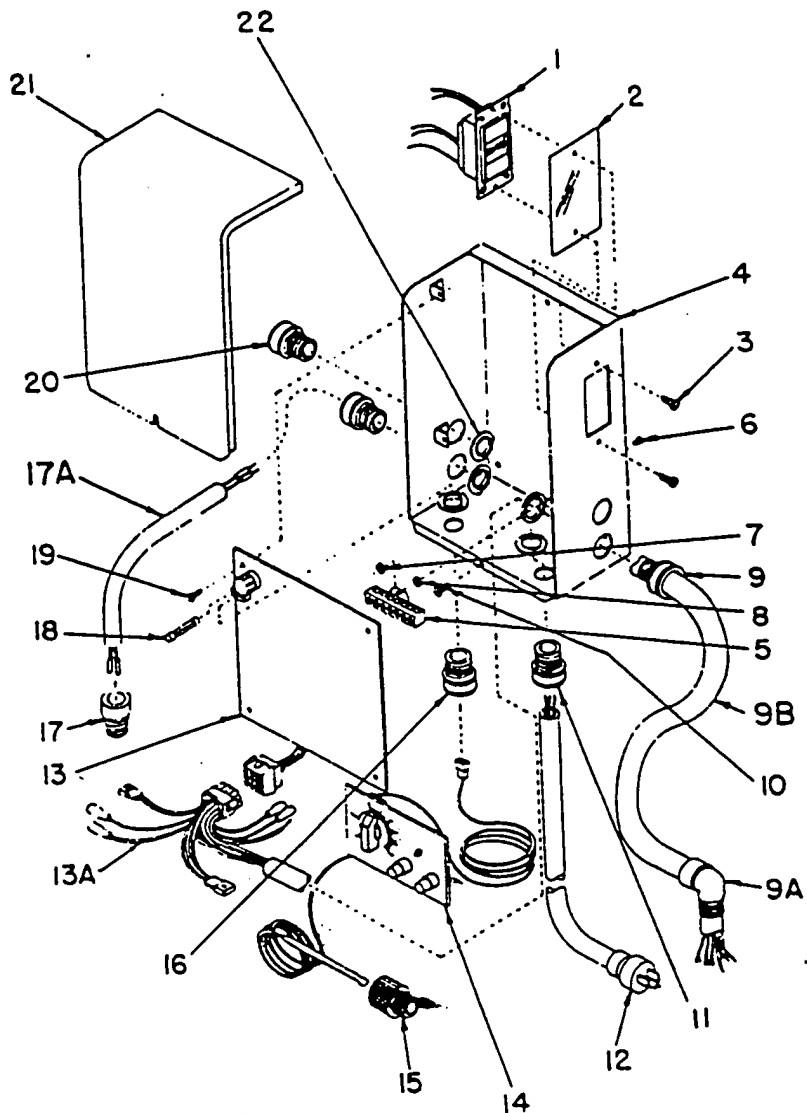
12. REMOTE PANEL AND THERMOWELL INSTALLATION

Install remote panel at location desired at the spa/hot tub site. **BE SURE** that water does not come in contact with rear side of panel and that a positive drain exists behind the panel should any water leak to this location. If front side of panel is expected to come in contact with water, lay a bead of RTV silicon sealant around edge of panel before panel is secured to the mounting surface.

Install thermowell in suction piping as shown in Figure 4 as close to the spa/hot tub as possible. This will enable the most accurate sensing of spa/hot tub water temperature and will allow minimum of time between spa/hot tub water cool down and heater start-up to maintain temperature. If thermowell is installed in middle section of tee, be sure tee points to side or down as shown in Figure 4 such that thermowell is completely immersed in water for accurate temperature sensing. If installed vertically, thermowell could be surrounded by air which would cause incorrect temperature sensing.

To install thermowell into plastic compression fitting in tee assembly, disassemble fitting and thread body of fitting into reducer. Then, slip plastic fitting nut, yellow ring and neoprene boot onto thermowell capillary tube. Yellow ring and neoprene boot are split such as to allow them to be slipped onto capillary tube without having to slip over thermowell. With neoprene boot at least $\frac{1}{2}$ " away from thermowell and capillary tube junction, assemble and tighten plastic fitting. Thermowell is now installed.

CONTROL BOX EXPLODED VIEW



CONTROL BOX REPAIR PARTS LIST

Key No.	Part Description	No. Used	Part Number
1	Ground Fault Interrupter	1	U17-716A
2	Cover	2	WC3-46P
3	Screw - #6 - .32 x 1/2" Lg.	2	U30-402C
4	Control Box Shell	1	WC117-93B
5	Ground Bar	1	U17-717
6	Screw - #8 - 32 x 3/8" Lg.	1	U30-143SS
7	Nut - #8 - 32	1	U36-52SS
8	Lockwasher - 1/4"	1	U43-23SS
9	Connector	1	WC117-100
9A	Connector	1	WC117-103
9B	Heater Cord	1	WC117-108
10	Screw - #10 x 3/8" Lg.	1	U30-842
11	Connector	1	WC117-102

Key No.	Part Description	No. Used	Part Number
12	Cord & Plug Assembly	1	U17-715
13	Logic Board	1	WC17-96
13A	Wire Harness w/Heater Cord	1	WC17-109
14	Remote Panel	1	WC17-95
15	Compression Fitting	1	WC117-95
16	Connector	1	WC117-97
17	Connector	2	WC117-101
17A	Flow Switch Cord	1	WC17-107
18	Fuse - AGC - 0.10 Amp - 250 Volt	1	U17-723
19	Screw - #10 x 3/8" Lg.	5	U30-842
20	Connector	1	WC117-98
21	Cover - Control Box	1	WC17-948
22	Locknut	6	U30-112C

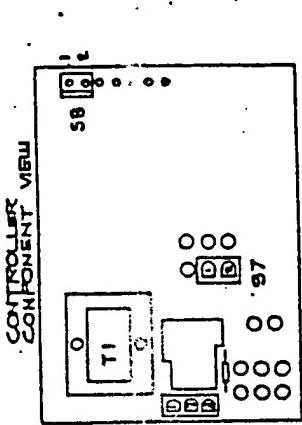
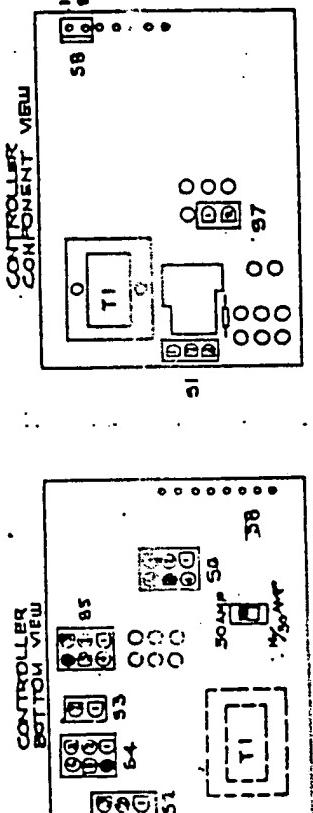
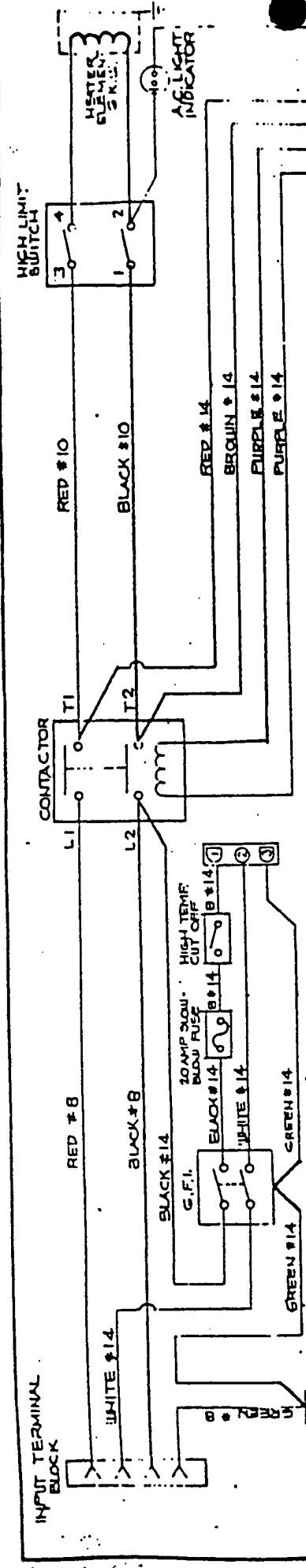
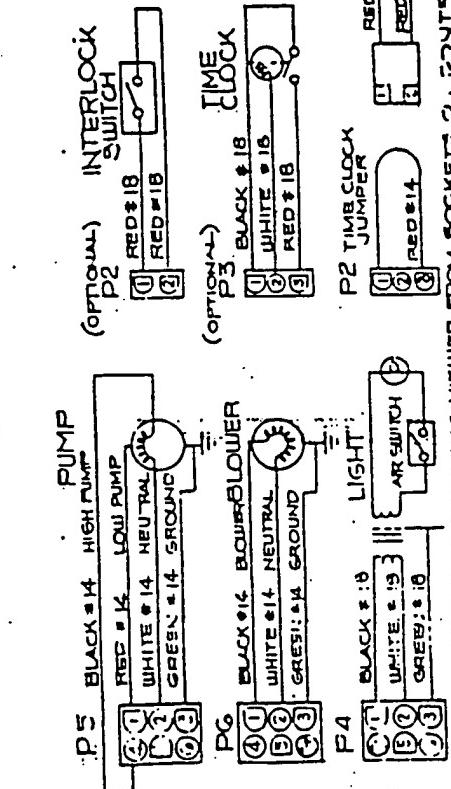


FIGURE 2 & CIRCUITS
ST-800

1. TO INSTALL INTERLOCK; REMOVE FROM R9 LEADS MUST BE CLIPPED AND R9 REMOVED.
2. TO INSTALL TIME CLOCK P2 IS TO BE REMOVED AND DISCARDED.
3. MUSE MUST BE UL APPROVED & AC 20 AMP SLOW-BLOW.
4. *P FOLLOWED BY A NUMBER IS A PLUG CONNECTOR & FOLLOWED BY A NUMBER IS A SOCKET CONNECTOR.



CONTROLLER FUNCTIONS
WITH AMPERAGE SWITCH IN 10 AMP POSITION

MODE	LOW	HIGH	AMPERAGE	NOTE
1	ON	OFF	ON	ON
2	OFF	ON	ON	OFF
3	ON	OFF	ON	ON
4	OFF	ON	OFF	OFF

NO	ECO	APP	DATE
1			
2			
3			
4			

NOTE:
WITH AMPERAGE SWITCH IN 50 AMP POSITION HEATER IS ON AS NEEDED IN ALL MODES.

ITEM	DESCRIPTION	SCALE	DATE
1	HTS	1/16	5/1/91
2	5-1-86	1/16	5/1/91

1986

NOTE: THE C13
RECEIVE INPUTS THIS IS UNPLUGGED
FOR FIRE 220. CONTROL 110V

PREMIER PARTS & POWERS PRODUCTS, INC.

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LOS ANGELES, CA 90034

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INSTALLATION AND OPERATION MANUAL



ST-1100 CONTROL CENTER

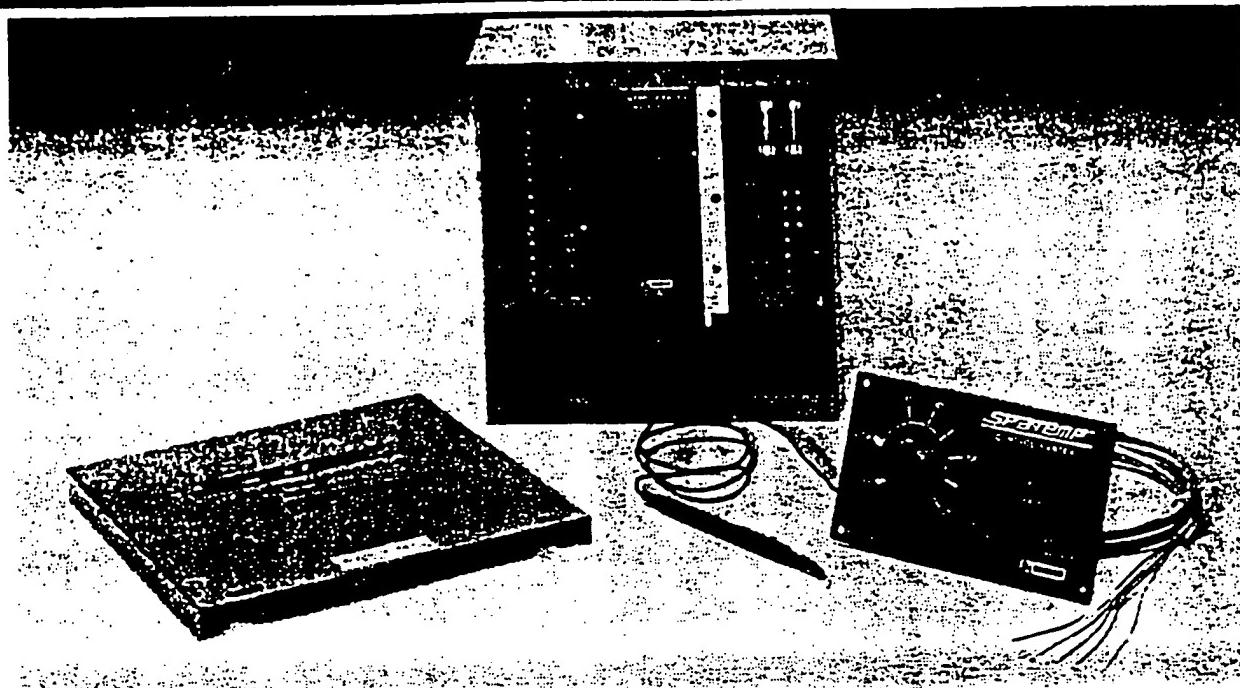


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LOW VOLTAGE TEST

1. Turn off all power at breakers.
2. Remove equipment board can cover and remove all 6 spa control low voltage wires on the right side of the equipment board.
3. Turn ON main power. CAUTION — LEFT HAND SIDE OF EQUIPMENT BOARD WILL NOW BE LIVE.
4. Using jumper wire on right side of board (DC side)
 - A. Jump RED TERMINAL to BLACK TERMINAL.
Pump (Jets) should turn ON.
 - B. Jump RED TERMINAL to BLUE TERMINAL
Blower should turn ON.
 - C. Jump RED TERMINAL to BLACK TERMINAL and to WHITE TERMINAL
Pump should turn ON and heater should FIRE. If heater does not fire, turn off breakers, remove heater wires in Spa-Temp HEATER terminals and twist together. Turn on breakers and jump RED terminal to BLACK terminal — pump should turn ON and heater should FIRE. If heater doesn't fire the problem is in the heater or in the wiring from the heater to the HEATER terminals. If heater fires, return Equipment Board to RAMCO for repair.

If all the tests in Step 4 are positive, the problem is in the low voltage wire or the CONTROL PANEL.

Check all the following:

1. 6 conductor wire damaged—replace wire and waterproof splices per Section 2.1 (Figure 8), page 4.
2. Splices in 6 conductor wire not waterproofed thus causing intermittent functioning. Resplice using waterproofing method in Section 2.1 (Figure 8), page 4.
3. Thermostatic switch filled with water—heater or READY light won't turn OFF.
Dry switch with hair dryer set on "low" for 15 minutes to drive water out of switch. Determine reason for water backing up behind Control Panel and correct problem. REVIEW Section 2.1. Seal down faceplate with clear silicone sealant.
4. Pushbutton switches filled with water because seals were damaged on back of switches and correct drainage was not provided for back of faceplate. Send Control Panel to Ramco for repair and provide positive drain per Section 2.1

4.0 ACCESSORIES

IN HOUSE REMOTE CONTROL

Pump switch controls pump. "Ready" light illuminates when spa reaches desired temperature. Spa-Temp switch deactivates spa-side controls and keeps heater OFF. Can be used with or without time clock.

IN-HOUSE PANEL: Brushed stainless steel.

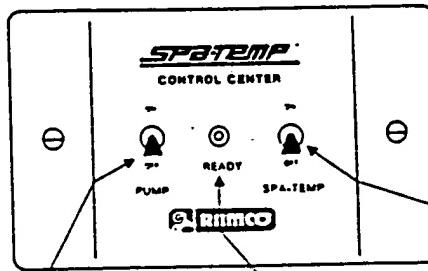
INPUT POWER: 115 Volt or 230 Volt.

IN-HOUSE VOLTAGE: 6 Volt D.C.
(no conduit required).

INSTALLATION HARDWARE INCLUDED: Sheet rock box to mount in-house control, 30 feet 6 conductor cable, wire nuts, hardware.

For single speed pump system — ORDER ST-1150A
For 2 speed pumps and 2 pump systems — ORDER ST-1150

IN HOUSE PANEL



SPA-TEMP DISABLE SWITCH
Turns ON your at-the-Spa Control Center.

With switch OFF:

- Heater will always stay OFF.
- Jets and Blower cannot be turned ON.

HOW TO USE YOUR IN-HOUSE REMOTE CONTROL

PUMP SWITCH	SPA-TEMP SWITCH	WHAT HAPPENS
OFF	OFF	<ul style="list-style-type: none"> • Filtration pump OFF • Time clock turns filtration pump ON and OFF. • Heater, Jets & Blower remain OFF (at-Spa Control Center inactivated)
ON	OFF	<ul style="list-style-type: none"> • Filtration pump ON. • Heater, Jets, Blower remain OFF (at-Spa Control Center inactivated)
ON	ON	<ul style="list-style-type: none"> • Turns ON entire Spa System. • Filtration pump ON • Heater—ON • At Spa Control Center activated • Ready Light ON when Spa reaches desired temperature.
OFF	ON	<ul style="list-style-type: none"> • Everything OFF until time clock turns system ON—then entire system turns ON and comes up to temperature ready for use. • Makes use of time clock programming.

FREEZE PROTECTION ST-800

Reads water temperature in plumbing and turns ON pump when freezing is sensed. Completely passive — draws no power during stand-by. Only operates system when needed for short periods of time.



2.4 BLOWER WIRING

Line power must be provided to ST-1100 terminals labeled LINE 3 and LINE 4 or blower will not function. LINE 3 and LINE 4 can be wired from separate breaker as shown or wired with jumper wires from LINE 1 and LINE 2 if codes permit.

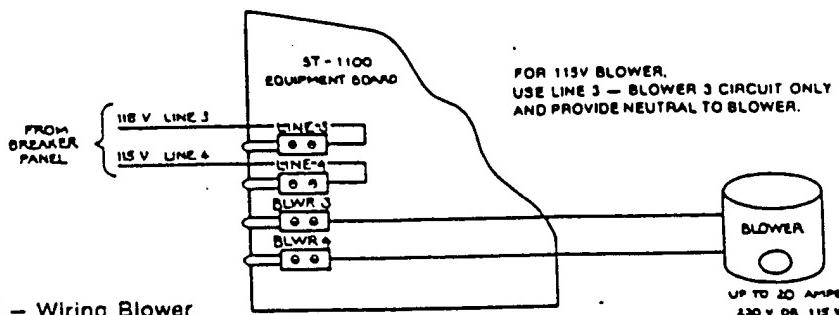


FIGURE 19 – Wiring Blower

2.5 HEATER WIRING

The two-SPA-TEMP "HEATER" terminals are internally connected to a small relay — when heat is needed, the relay closes, thus connecting the two "HEATER" terminals.

The internal "HEATER" terminals relay is limited to switching 25 VA and MUST NOT be wired in a manner requiring the relay to switch excessive power.

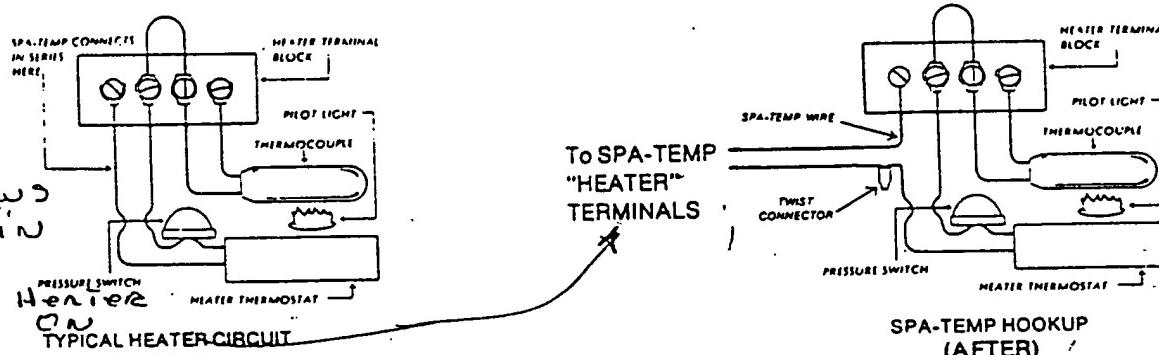
The relay is more than adequate to control gas millivolt systems, electronic pilotless gas systems, and electric heater contactors (power relays).

2.5.1 GAS MILLIVOLT HEATERS

Gas millivolt systems consist of a Thermocouple — Pressure Switch — Thermostat — Gas Valve circuit. SPA-TEMP "HEATER" terminals connect in SERIES anywhere in the circuit. If heater has OFF/ON switch, connection can be made in series with this switch.

**CAUTION: Do not bypass or disable heater pressure switch
OR FIRE MAY RESULT.**

This Shows
Sensor in
Series
Causing a
Harmful
Typical Heater-Circuit
(BEFORE)



NOTE: USE 18 gauge or heavier wire for heater wiring.

FIGURE 20 – Wiring Gas Millivolt Heater

CAUTION: Route wiring inside heater in such a manner that the wires cannot be melted by heater internal temperatures.

2.5.2 PILOTLESS GAS ELECTRONIC HEATERS

Electronic heaters use either 115V or 230V line power input. Connect the Spa-Temp HEATER terminals in series with the heater Line Input. Spa-Temp will then switch the input power to the heater.

CAUTION: Make sure you provide the correct input power for your heater. If your heater is internally wired for 115V and you provide 230V power, you may destroy the heater controls and the Spa-Temp internal "HEATER" Relay.

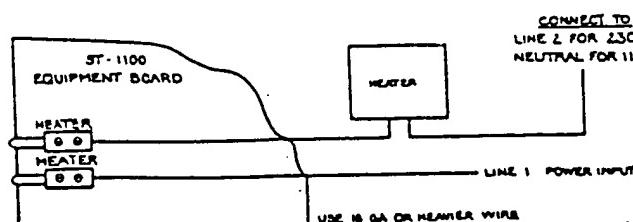


FIGURE 21 — Wiring Electronic Pilotless Gas Heater

LOW VOLTAGE TEST

1. Turn off all power at breakers.
2. Remove equipment board can cover and remove all 6 spa control low voltage wires on the right side of the equipment board.
3. Turn ON main power. CAUTION — LEFT HAND SIDE OF EQUIPMENT BOARD WILL NOW BE LIVE.
4. Using jumper wire on right side of board (DC side)
 - A. Jump RED TERMINAL to BLACK TERMINAL.
Pump (Jets) should turn ON.
 - B. Jump RED TERMINAL to BLUE TERMINAL
Blower should turn ON.
 - C. Jump RED TERMINAL to BLACK TERMINAL and to WHITE TERMINAL
Pump should turn ON and heater should FIRE. If heater does not fire, turn off breakers, remove heater wires in Spa-Temp HEATER terminals and twist together. Turn on breakers and jump RED terminal to BLACK terminal — pump should turn ON and heater should FIRE. If heater doesn't fire the problem is in the heater or in the wiring from the heater to the HEATER terminals. If heater fires, return Equipment Board to RAMCO for repair.

If all the tests in Step 4 are positive, the problem is in the low voltage wire or the CONTROL PANEL.

Check all the following:

1. 6 conductor wire damaged—replace wire and waterproof splices per Section 2.1 (Figure 8), page 4.
2. Splices in 6 conductor wire not waterproofed thus causing intermittent functioning. Resplice using waterproofing method in Section 2.1 (Figure 8), page 4.
3. Thermostat switch filled with water—heater or READY light won't turn OFF.
Dry switch with hair dryer set on "low" for 15 minutes to drive water out of switch. Determine reason for water backing up behind Control Panel and correct problem. REVIEW Section 2.1. Seal down faceplate with clear silicone sealant.
4. Pushbutton switches filled with water because seals were damaged on back of switches and correct drainage was not provided for back of faceplate. Send Control Panel to Ramco for repair and provide positive drain per Section 2.1

4.0 ACCESSORIES

IN HOUSE REMOTE CONTROL

Pump switch controls pump. "Ready" light illuminates when spa reaches desired temperature. Spa-Temp switch deactivates spa-side controls and keeps heater OFF. Can be used with or without time clock.

IN-HOUSE PANEL: Brushed stainless steel.

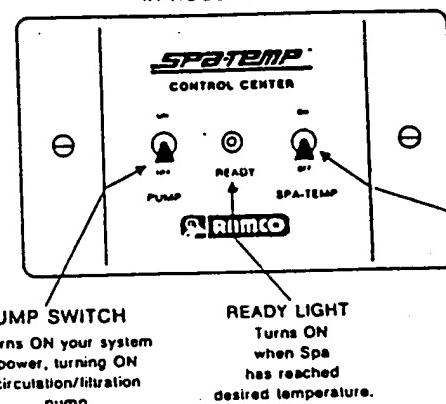
INPUT POWER: 115 Volt or 230 Volt.

IN-HOUSE VOLTAGE: 6 Volt D.C.
(no conduit required).

INSTALLATION HARDWARE INCLUDED: Sheet rock box to mount in-house control, 30 feet 6 conductor cable, wire nuts, hardware.

For single speed pump system — ORDER ST-1150A
For 2 speed pumps and 2 pump systems — ORDER ST-1150

IN HOUSE PANEL



SPA-TEMP DISABLE SWITCH

TURNS ON your at-the-Spa Control Center.

With switch OFF:

- Heater will always stay OFF.
- Jets and Blower cannot be turned ON.

HOW TO USE YOUR IN-HOUSE REMOTE CONTROL

		<u>WHAT HAPPENS</u>
<u>PUMP SWITCH</u>	<u>SPA-TEMP SWITCH</u>	
		<ul style="list-style-type: none"> • Filtration pump OFF • Time clock turns filtration pump ON and OFF. • Heater, Jets & Blower remain OFF (at-Spa Control Center inactivated)
		<ul style="list-style-type: none"> • Filtration pump ON. • Heater, Jets, Blower remain OFF (at-Spa Control Center inactivated)
		<ul style="list-style-type: none"> • Turns ON entire Spa System. • Filtration pump ON • Heater—ON • At Spa Control Center activated • Ready Light ON when Spa reaches desired temperature.
		<ul style="list-style-type: none"> • Everything OFF until time clock turns system ON—then entire system turns ON and comes up to temperature ready for use. • Makes use of time clock programming.

FREEZE PROTECTION — ST-800

Keeps water temperature in plumbing and turns ON pump when freezing is sensed. Completely passive — draws no power during stand-by. Only operates system when needed for short periods of time.



INSTALLATION AND OPERATION MANUAL



ST-800 FREEZE PROTECTOR

WHEN INSTALLED WITH SPA-TEMP ST-1100 CONTROL CENTER

- FOR ONE PUMP (SINGLE SPEED) SYSTEM

Works directly with ST-1100 Control Center with or without ST-1150A In-House Control.

- FOR 2 SPEED PUMP AND 2 PUMP SYSTEMS

Install with ST-1150 In-House Control or ST-600 Electrical Interface.

WHEN INSTALLED WITHOUT SPA-TEMP ST-1100 CONTROL CENTER

- Install with ST-600 Electrical Interface to provide freeze protection for any pump to 2 HP/230V, 1 HP/115V.

DESCRIPTION

Senses actual water temperature in plumbing and turns pump ON when danger of freezing is sensed (40°F).

Turns pump OFF when water temperature rises to 50°F. Pump runs only for short periods of time when needed, taking advantage of spa "Thermal Mass."

The ST-800 freeze protector is designed to switch only the 6 volt D.C. Spa-Temp control signal — DO NOT CONNECT A.C. POWER TO THE ST-800 OR IT WILL BE DESTROYED!

Multiple ST-800 Freeze Protectors may be installed in parallel in a single pump piping line to provide multiple freeze protection sensor points.

READ ENTIRE INSTRUCTIONS BEFORE STARTING INSTALLATION

INSTALLING THE SENSOR

The sensor should be located in the plumbing area most likely to freeze. Typically this is the piping exposed to weather and near the spa pump. Install the sensor in a PVC Tee using the slip adaptor supplied. Tee should be on the SUCTION side of the pump as shown in Figure 1.

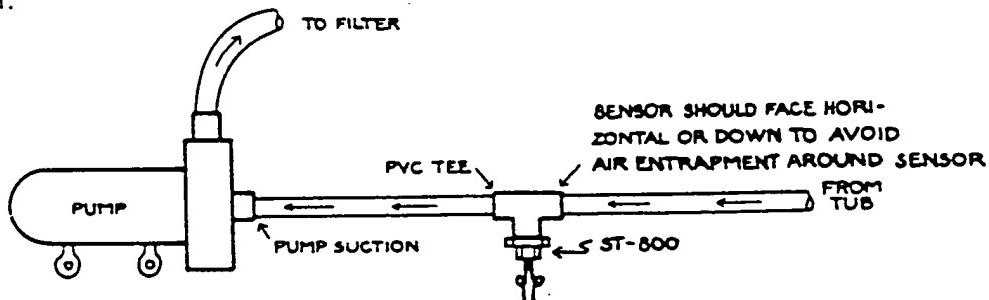


FIGURE 1 — INSTALLATION OF SENSOR

Multiple sensors may be installed (if desired) anywhere in the water circuit. The sensors must be wired in parallel as shown in Figure 2.

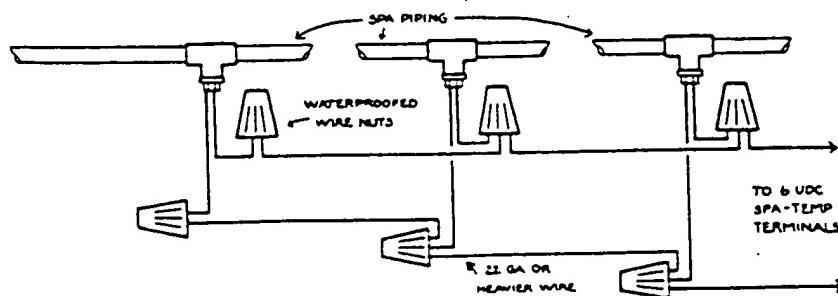


FIGURE 2 — MULTIPLE SENSOR INSTALLATION



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1.0 DESCRIPTION

The Spa-Temp ST-1100 Control Center by Ramco is designed to control all spa equipment from the comfort of your spa. The ST-1100 senses the water temperature directly in your spa and maintains selected temperature to within $\pm \frac{1}{2}$ F. Individual control buttons provide remote control of hydro therapy jets and bubble massage (blower). The "Ready" light shows when your spa has reached the selected temperature. The ST-1100 Control Center provides excellent performance and reliability when installed according to the instructions in this manual.

SPECIFICATIONS

PUMPS: Single speed pump, 2 speed pump, 2 pump systems.

Maximum size pump: 2 HP — 230 VOLTS/60 HZ
1 HP — 115 VOLTS/60 HZ

BLOWERS: 115 VOLT or 230 VOLT up to 20 AMPS.

HEATERS: Gas millivolt, pilotless electronic gas, electric, demand type gas water heaters.

INPUT POWER: 115 VOLT/60 HZ or 230 VOLT/60 HZ. Separate power input provided for blower (blower may be on separate breaker). Legal white NEUTRAL required when operated on 230 VOLT/60 HZ.

VOLTAGE AT SPA: 6 VOLTS D.C. — 100 MA MAXIMUM. Spa Control grounded. 6 VDC signal protected by 100 MA fast blow fuse.

1.1 CONTROL PANEL (FACEPLATE)

THERMOSTAT allows you to select desired temperature and maintains temperature to within $\pm \frac{1}{2}$ F.

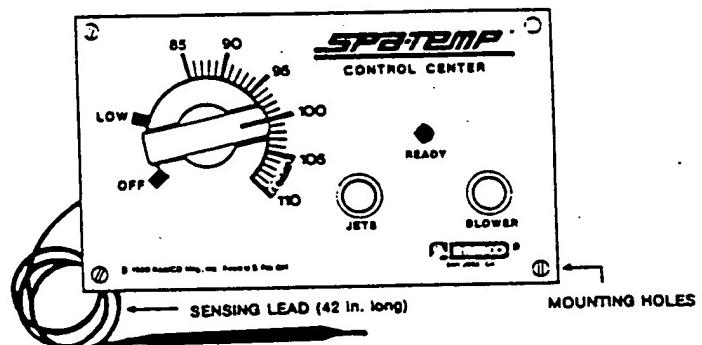
READY LIGHT turns ON when spa reaches selected temperature, turns OFF when thermostat turns ON heater.

LOW position keeps spa in the 60-70° F range for standby. OFF position keeps heater OFF.

JETS button turns Jets ON and OFF.

BLOWER button turns Blower ON and OFF.

FIGURE 1 — Control Panel



1.2 EQUIPMENT BOARD (LOGIC BOARD)

HIGH VOLTAGE terminals switch and distribute power to spa equipment.

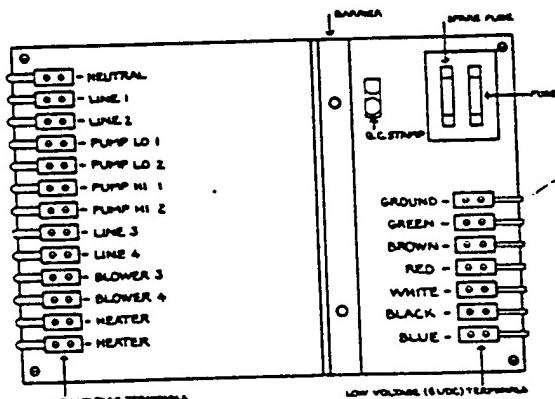
LOW VOLTAGE terminals are for connection to spa-side control panel, optional in-house controls and optional freeze protection (see Accessories, Section 4.0).

FUSE protects 6VDC power supply should a 6 VDC short circuit occur.

NOTE: Fuse must be tested with continuity meter as fuse wire is too fine to visually determine if "blown."

CONTROL CIRCUITRY works on 115 volts — a legal white "NEUTRAL" must be provided to NEUTRAL terminal.

FIGURE 2 — Equipment Board



1.3 INTERNAL ELECTRICAL SCHEMATIC

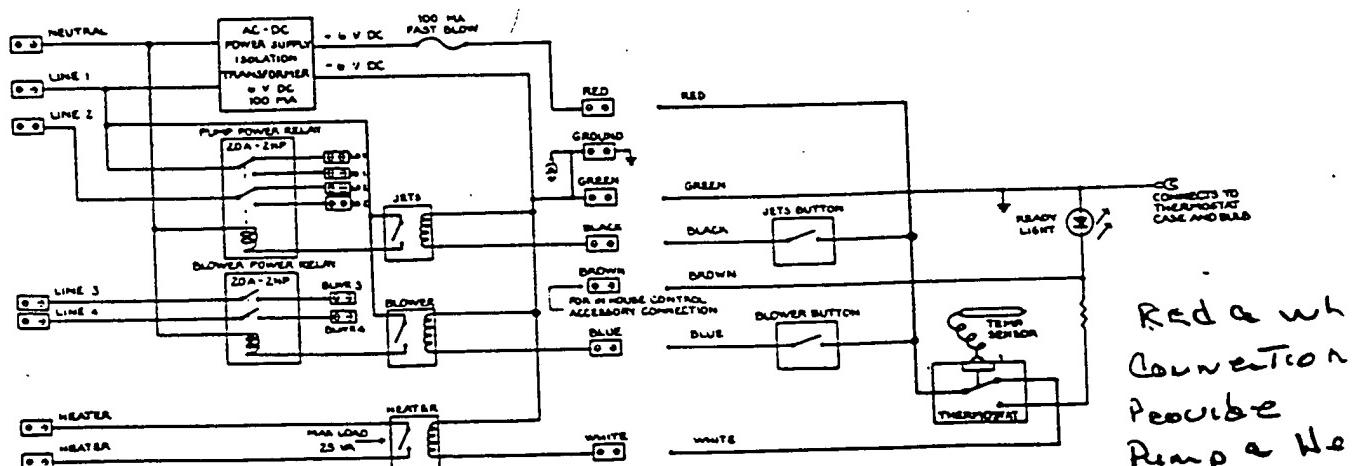
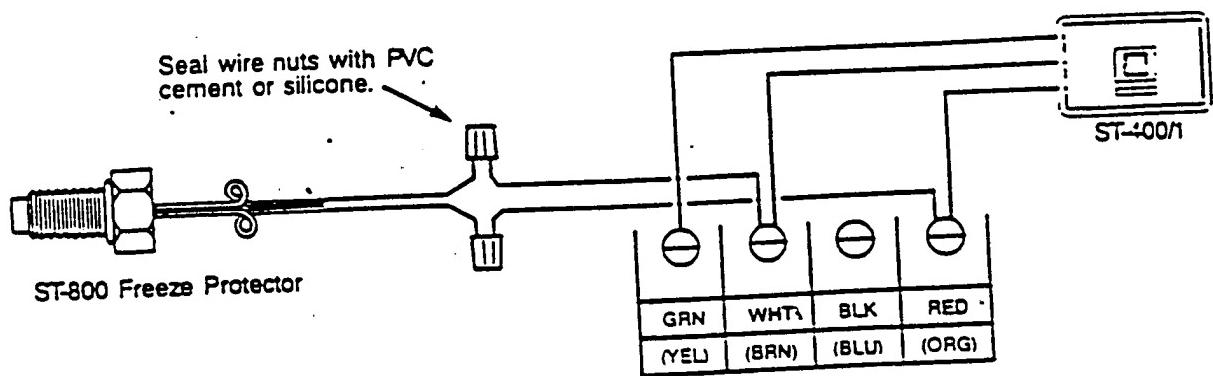


FIGURE 3 — Internal Electrical Schematic

Red & wh
Convention
Provide
Pump & He
To 50°

10-381

ADDING FREEZE PROTECTION

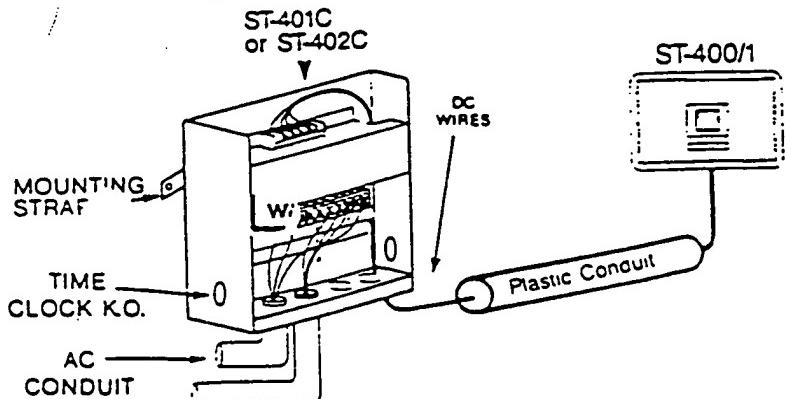


The ST-800 Freeze Protector will turn on at 40°F and off at 50°F. Connect Freeze Protector between the RED and WHT (BRN) DC terminals as shown. When freezing approaches, the ST-800 will turn on the WHT (BRN) channel just like pushing the ST-400/1 pushbutton.

INSTALLATION OF EQUIPMENT CAN:

Attach mounting strap to back of can using two #8 screws supplied. Securely attach can assembly to vertical surface. Route AC and DC wires as shown for maximum isolation.

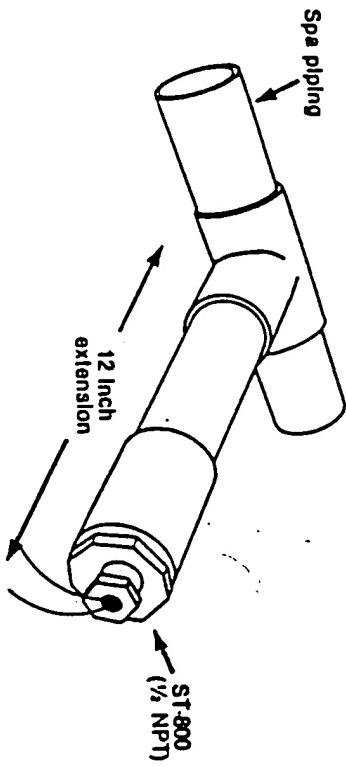
CAUTION: DO NOT INSTALL EQUIPMENT CAN WITHIN 5 FEET OF SPA.



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Select area of plumbing most likely to freeze first — consider "windchill" factors, etc. Install sensor at end of extension off pump plumbing as shown:



The 12 inch extension provides a "time delay." Main spa water must mix throughout 12 inch extension before the sensor will turn off. Additionally the extension ensures the ST-800 will sense freezing conditions before the main plumbing begins to freeze.

CAUTION: INSTALL EXTENSION EITHER HORIZONTALLY OR IN DOWNWARD POSITION TO AVOID AIR ENTRAPMENT AROUND SENSOR.

- Minimum 1 inch pipe should be used for extension.
- If in doubt about area most likely to freeze — use multiple ST-800s and wire in parallel so any sensor will turn desired channel ON.
- On two speed pumps, always activate High Speed Channel — low speed has insufficient head pressure to prevent freezing in severely cold climates.

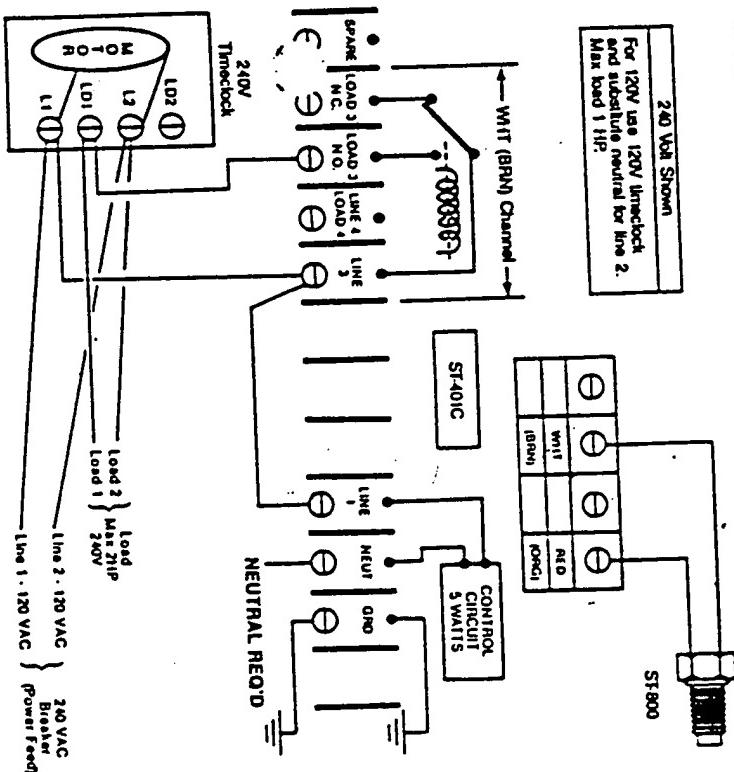
Using 22 gauge or heavier Control Terminals in your ST-401C or ST-402C. Exact wiring instructions are included with each Control Head.

001, 400/2, 400/3, 132, 1200/4.

To Operate	Connect ST-800 Between White Channel Black Channel
	Red & White Terminals Red & Black Terminals

TESTING:
After all wiring has been completed, immerse sensor in ice water before installing sensor into plumbing. Allow several minutes for sensor to activate.

TYPICAL TIMECLOCK BYPASS SYSTEM USING ST-401C:



- HEATING WITH TIMECLOCK — You can heat up your spa in your absence by taking advantage of your timeclock programming. Turn ON/OFF button ON and set THERMOSTAT to desired temperature. When your timeclock turns the pump ON your spa will automatically heat.

CAUTION: Make sure your timeclock is set to stay ON long enough to fully heat up spa such that HEATER is turned OFF at least 10 minutes before timeclock turns OFF. Otherwise heater damage can occur by shutting OFF pump when heater is HOT. This is especially important with gas fired heaters.

- TIMECLOCK FILTRATION WITHOUT HEAT — Keep ON/OFF button OFF. This will de-activate thermostat.

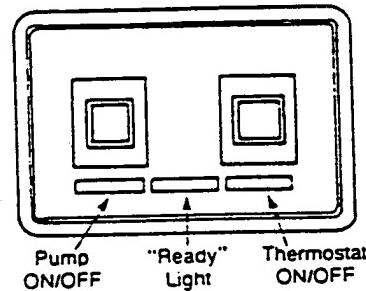
CARE AND MAINTENANCE:

Your Control Center can be cleaned with common non-abrasive household cleaners. Flush with clean water after cleaning. No other maintenance is required.

FREEZE PROTECTION:

If your spa is equipped with the optional Spa-Temp ST-800 FREEZE PROTECTOR, during freezing weather conditions leave your ON/OFF button ON (Jets-Light-Blower OFF) and set THERMOSTAT to LOW or hotter. This will ensure that heat will be added to your spa when ST-800 turns ON your pump.

OPTIONAL IN-HOUSE CONTROL ST-1200/4 IH



Provides in-house convenience in a handsome, compact 2 1/4 X 3 1/2 inch control panel. Easily installed into any wall, nightstand, headboard, etc.

The ST-1200/4 IH allows you to:

- Heat up spa and see when it is ready — only go outside to USE your spa.
- Programs spa to heat up with timeclock — spa can be ready when you come home from work.
- Program spa to automatically add heat in freezing conditions.
- Turn on pump without heat for fast spa cleanup.
- Monitor spa use — lights inside house will illuminate when spa-side panel is turned ON.

Part No. 5012-2002 REV 0

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OPERATION

The ST-800 Freeze Sensor, when wired correctly, turns ON the circulation pump when 40°F water is sensed in the spa plumbing. In severe cold weather, freeze damage can occur even with the spa pump ON if the spa water temperature is allowed to drop near freezing. To prevent this, your heater should be programmed to "fire" when the ST-800 Freeze Sensor turns ON the pump as follows (only required for severe cold weather):

SYSTEMS WITHOUT SPA-TEMP IN-HOUSE CONTROLS — keep main heater switch ON and make sure heater thermostat or Spa-Temp thermostat is set to LOW or hotter.

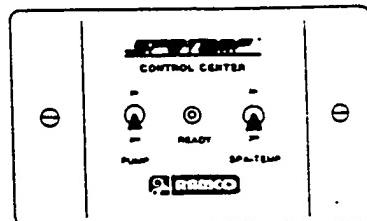
SYSTEMS WITH SPA-TEMP IN-HOUSE CONTROLS — set Spa-Temp thermostat to LOW or hotter and keep in-house Spa-Temp switch ON.

TOTAL SYSTEM FREEZE PROTECTION FOR SEVERE COLD WEATHER

In severe cold weather, freeze damage can also occur in the blower piping, and in the jet pump of a 2 pump spa system. To accomplish total freeze protection of all pumps and blower, the ST-1100 Control Center and the ST-1150 In-House Controls are required (Note: The ST-1150A cannot be used for Total System Freeze Protection). Wire system as shown in the ST-1150 instructions and according to Figure 5 of these instructions.

Program System For Total Freeze Protection As Follows:

1. Turn ON Pump Switch and Spa-Temp switch at In-House control panel.
2. Turn ON Jet Button and Blower Button at spa. Turn temperature to LOW or hotter.
3. Turn OFF Pump Switch in house, leave Spa-Temp Switch ON.



ST-1150 IN-HOUSE REMOTE CONTROL

When programmed in this manner, the ST-800 Freeze Sensor will turn ON your circulation pump, Jet pump (if 2 pump system), heater and blower for short periods of time when danger of freezing is sensed.

NOTE: If your system uses a time clock, the pumps, heater and blower will also turn ON when your time clock turns ON.

SPATEMP™ WARRANTY

RAMCO MANUFACTURING, INC. warrants to the original owner its SPA-TEMP ST-800 to be free from defects in material and workmanship for a period of 1 year from the date of purchase.

If found defective, return prepaid with proof of purchase to: Customer Service
RAMCO MFG., INC.
1086 North 11th Street
San Jose, CA 95112

The unit will be repaired or replaced at RAMCO's option.

Field Service Labor is specifically excluded from the terms of this warranty.

Except as set forth above, there shall be no other guarantee, warranty, or liability either expressed, implied or oral or statutory and in no event shall RAMCO MFG., INC., its agents or employees, be liable for injury or damage to any person or property whatsoever, or for any special, indirect, contingent, secondary or consequential damage of any nature however so arising.

Your specific legal rights under the limited warranty may vary from State to State.



RAMCO MFG., INC.



RAMCO MFG., INC. 1086 North 11th Street, San Jose, Calif. 95112 (408) 998-4500
Mfg. and Printed in USA

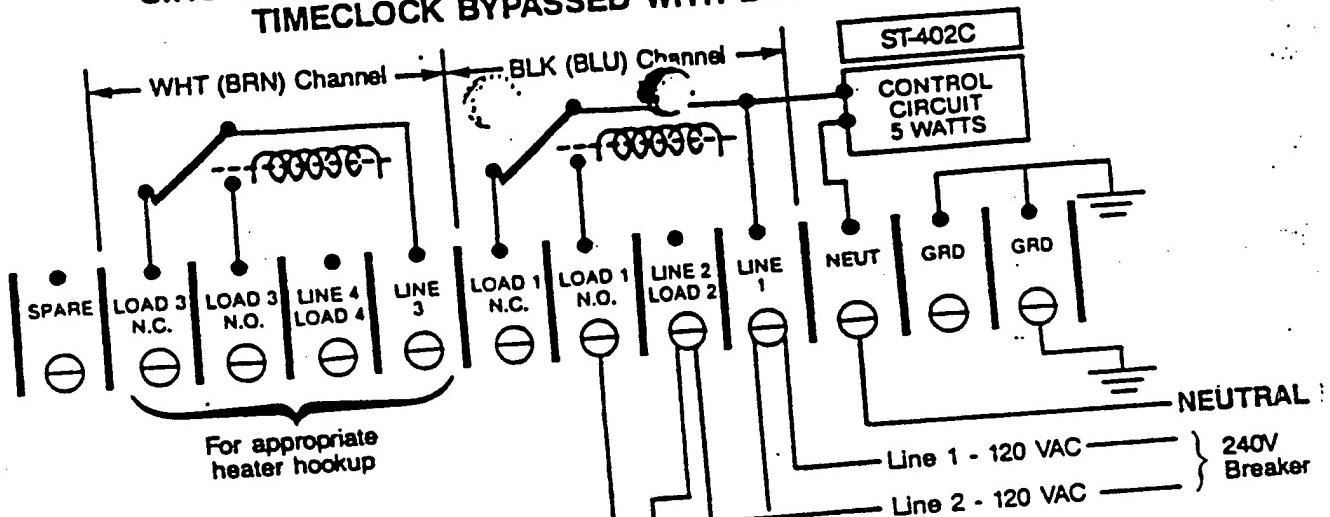
© 1982 RAMCO MFG., INC.

FORM 800/3821

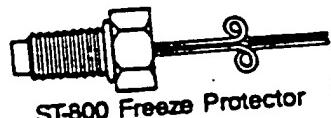
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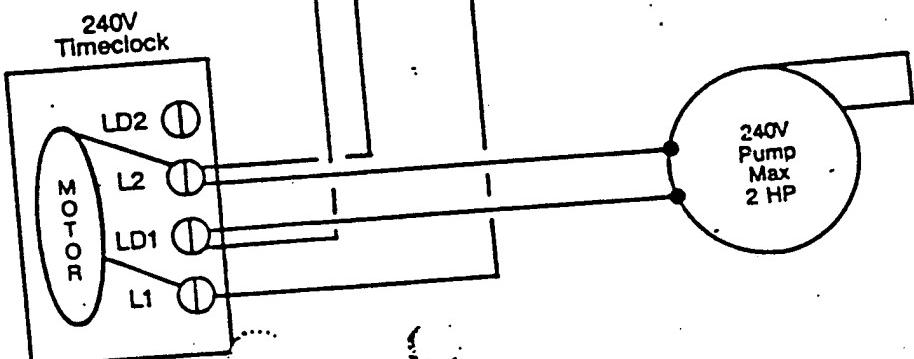
**SINGLE SPEED PUMP — TIMECLOCK CONTROLLED
TIMECLOCK BYPASSED WITH BUTTON**



Adding Freeze Protection



ST-800 Freeze Protector
Connect ST-800 between the RED and BLACK ST-402C D.C. Control Limited Energy Terminals. The ST-800 will turn ON the pump at 40°F and OFF at 50°F, just like pushing the ST-132 pushbutton.



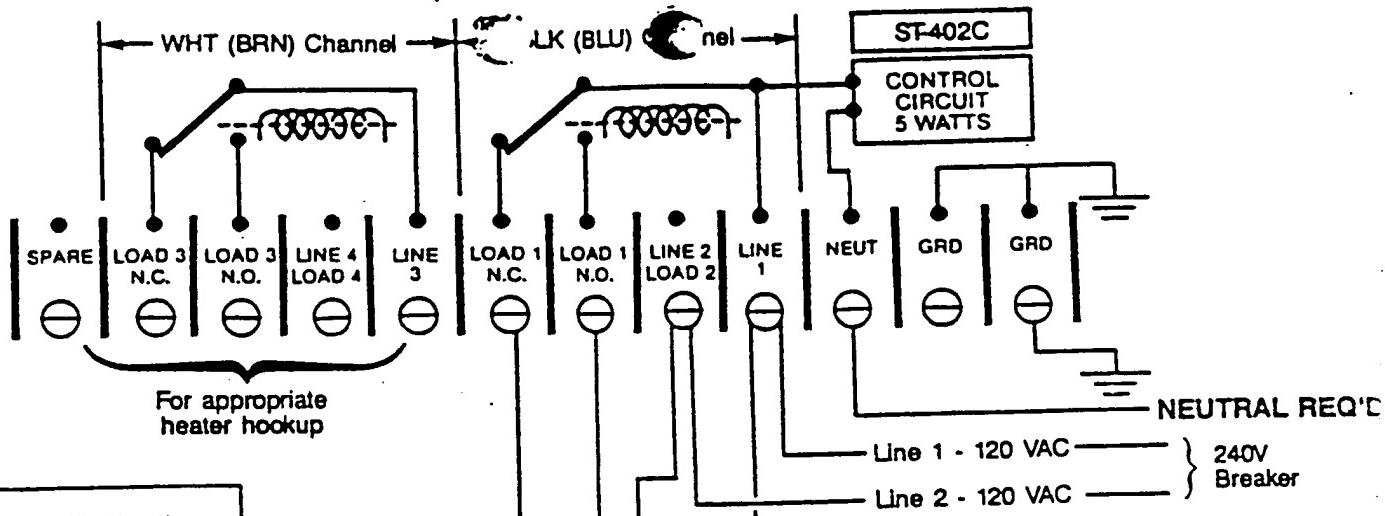
240 Volt Shown

For 120 volt pump use 120 volt timeclock and substitute neutral for line 2. Max load 1 HP.

012260

1302

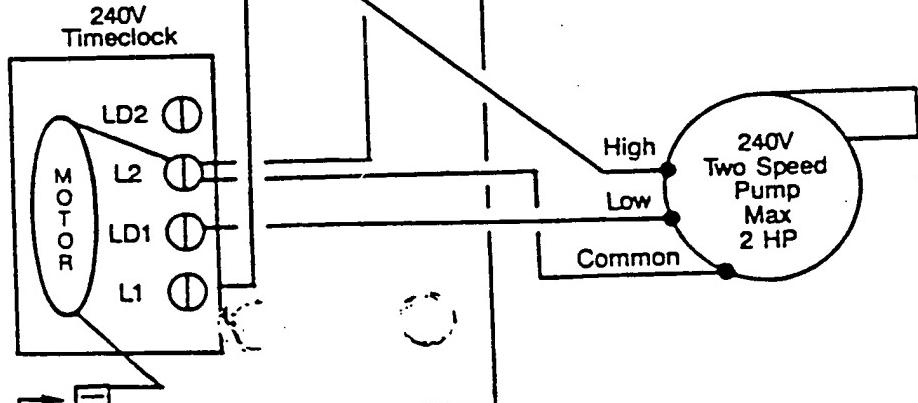
**TWO SPEED PUMP
TIMECLOCK CONTROLLED LOW SPEED
BUTTON CONTROLLED HIGH SPEED (BYPASSES TIMECLOCK)**



Adding Freeze Protection



ST-800 between the RED and BLACK ST-402C D.C. Control Limited Energy Terminals. The ST-800 will turn ON the pump at 40°F and OFF at 50°F, just like pushing the ST-132 pushbutton.



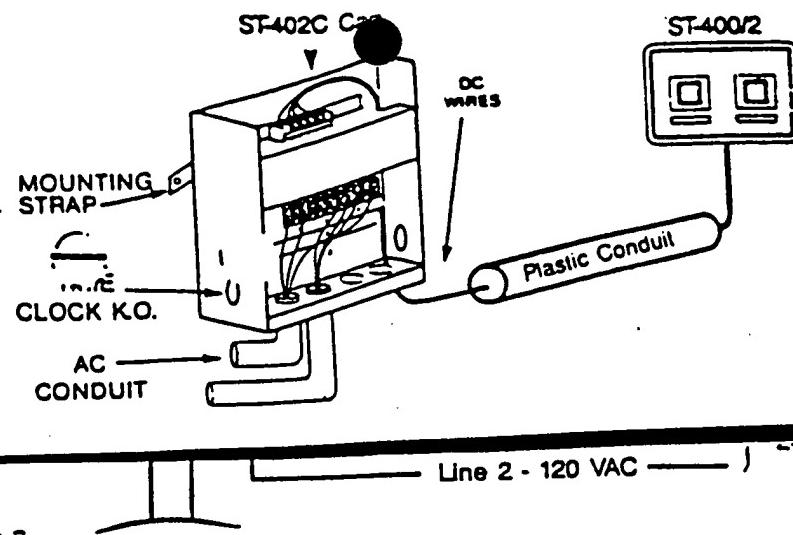
240 Volt Shown

For 120 volt pump use 120 volt timeclock and substitute neutral for line 2. Max load 1 HP.

INSTALLATION OF EQUIPMENT CAN:

Attach mounting strap to back of can using two #8 screws supplied. Securely attach can assembly to vertical surface. Route AC and DC wires shown for maximum isolation.

CAUTION: DO NOT INSTALL EQUIPMENT CAN WITHIN 5 FEET OF SPA.



ADDING FREEZE PROTECTION

The ST-800 Freeze Protector may be added to either the TE (BRN) or BLACK (BLU) channel by connecting it in parallel with the respective ST-400/2 button at the ST-402C DC control terminals:

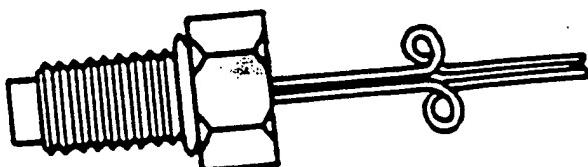
CHANNEL

WHITE (BRN)
BLACK (BLU)

CONNECT ST-800

Between RED and WHITE
Between RED and BLACK

The ST-800 will turn on the chosen channel just like pushing the respective ST-400/2 button. The ST-800 turns on at 40°F and off at 50°F.



ST-800 Freeze Protector

012262

1204

SPECIAL FREEZE PROTECTION INSTRUCTIONS:

- ST-1200/4 ON/OFF button can be used to select HEAT or NO HEAT when used with ST-800 Freeze Protector.
 - ON/OFF - ON: ST-800 Freeze Protector will turn ON pump and heater. Set ST-1200/4 thermostat to LOW or higher.
 - ON/OFF - OFF: Heater inactivated — ST-800 Freeze Protector will only turn ON pump.

012263

1205

For a reliable installation, the sensor splices must be waterproofed as shown in Figure 3.

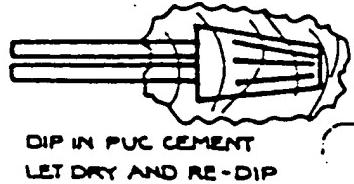
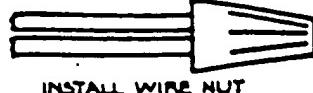
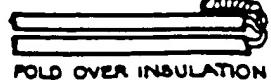
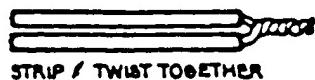


FIGURE 3 — WATERPROOFING 6 VDC WIRE SPLICES

WIRING THE SENSOR

ALL WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND/OR LOCAL CODES.
Use 22 gage or heavier wire for all sensor wiring.

SINGLE SPEED PUMP WITH ST-1100 CONTROL CENTER

Connect ST-800 leads to RED terminal and BLACK terminal on the D.C. side of the ST-1100 equipment board as shown in Figure 4.
Works with or without ST-1150A In-House Control.

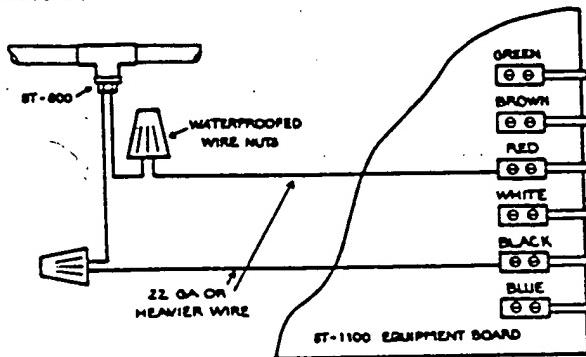


FIGURE 4 — WIRING TO ONE PUMP SINGLE SPEED SYSTEM
WITH ST-1100 CONTROL CENTER

TWO SPEED PUMP OR TWO PUMP SYSTEMS WITH ST-1100 CONTROL CENTER

NOTE: Requires the use of the ST-1150 In-House Remote Control, or ST-600 Interface to bypass time clock.

WITH ST-1150 IN-HOUSE REMOTE CONTROL

Connect the ST-800 leads to the two "REMOTE" 6VDC terminals in the ST-900 Time Clock Bypass (the ST-900 is part of the ST-1150 Remote Control Package)

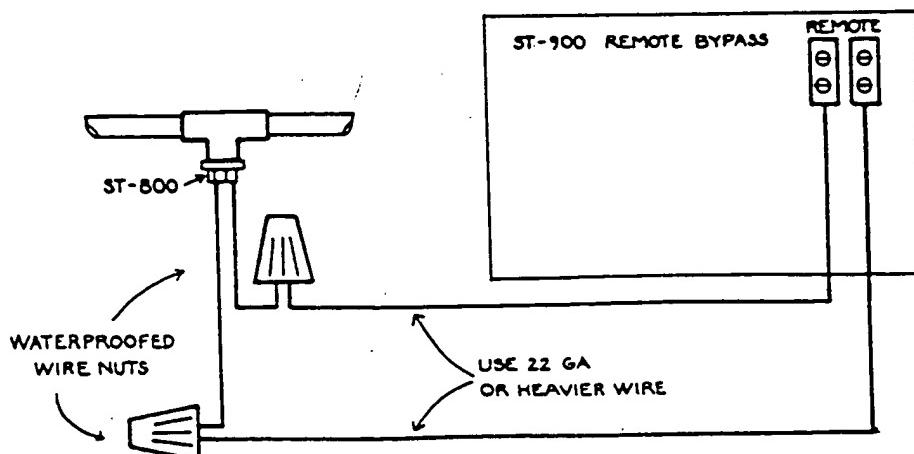


FIGURE 5 — WIRING TO 2 SPEED PUMP OR 2 PUMP SYSTEM WITH ST-1100 CONTROL CENTER
AND ST-1150 IN-HOUSE CONTROLS.

WITH ST-800 ELECTRICAL INTERFACE

Connect the ST-800 leads to the two terminals labeled "SPA-TEMP" as shown in Figure 6. Wire ST-800 as shown to "bypass" time clock.

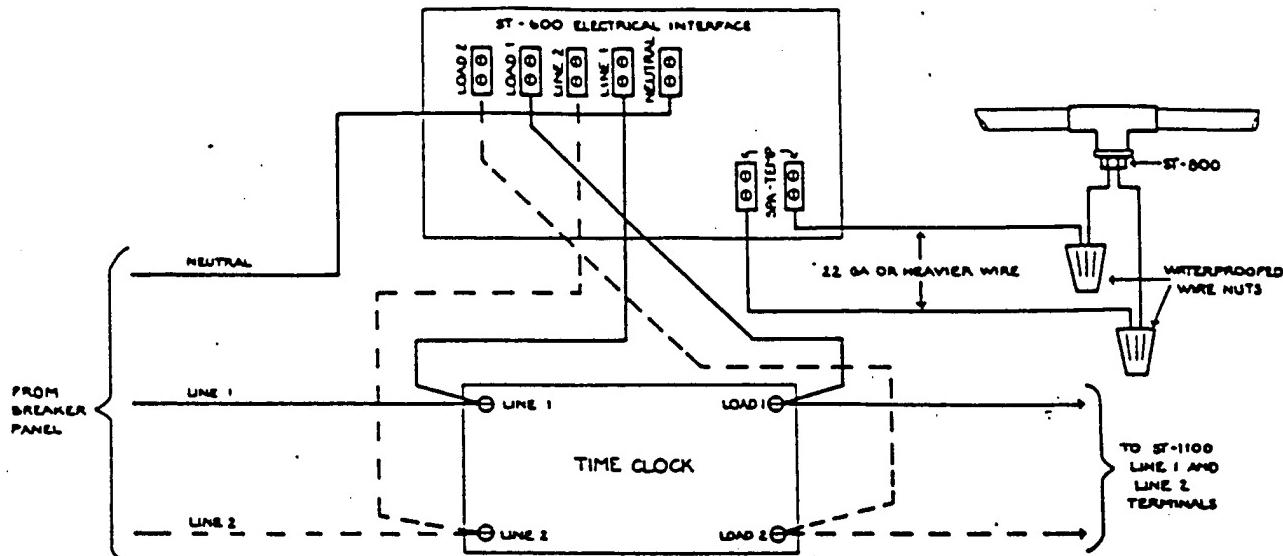


FIGURE 6 — WIRING TO 2 SPEED PUMP OR 2 PUMP SYSTEM WITH ST-1100 CONTROL CENTER AND ST-800 ELECTRICAL INTERFACE.

When wired as shown, the ST-800 will bypass time clock when danger of freezing is sensed, turning on circulation pump.

CAUTION

USE COLOR CODED WIRE FOR TIME CLOCK BYPASS WIRING (LINE 1 — LOAD 1 = RED, LINE 2 — LOAD 2 = BLACK). WIRE EXACTLY AS SHOWN. IF WIRES ARE CROSSED ANYWHERE, A DIRECT SHORT MAY OCCUR, DESTROYING THE ST-600 ELECTRICAL INTERFACE.

PUMPS WITHOUT ST-1100 CONTROL CENTER

Install with an ST-600 Electrical Interface, wiring as shown in Figure 7. The freeze protection A.C. circuit will then be in parallel with the existing A.C. power input circuit to the pump.

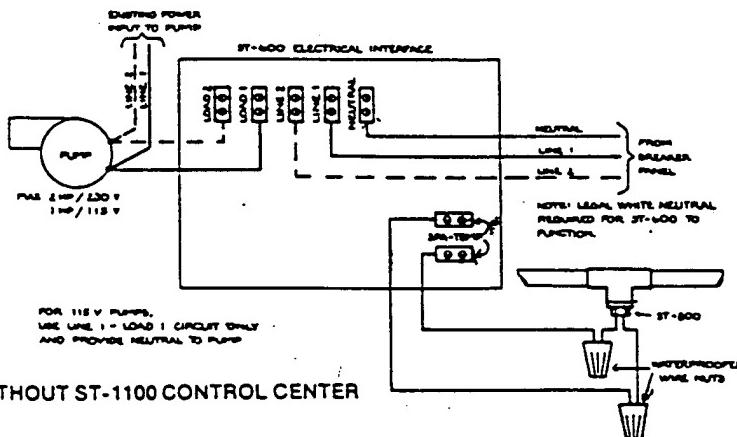


FIGURE 7 — WIRING PUMP WITHOUT ST-1100 CONTROL CENTER

CAUTION

USE COLOR CODED WIRE (RED=LINE 1 — LOAD 1, BLACK=LINE 2 — LOAD 2) AND WIRE EXACTLY AS SHOWN. IF RED AND BLACK WIRES ARE SWITCHED ANYWHERE, A DIRECT 220V SHORT WILL OCCUR WHEN PUMP AND FREEZE PROTECTION ARE BOTH ON. THIS WILL DESTROY THE ST-600 ELECTRICAL INTERFACE.

TESTING

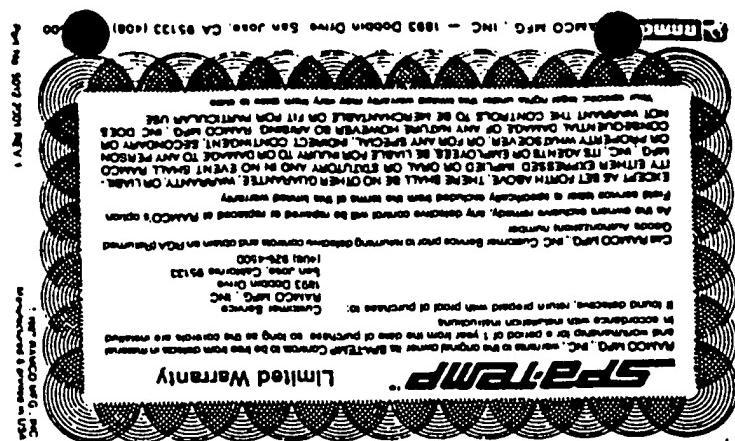
The freeze protection circuit may be tested by either of the following methods:

1. Submerge ST-800 Freeze Sensor in ice water until freeze protection circuit turns ON. The ST-800 Sensor will activate the freeze protection circuit at a minimum 40°F and will de-activate circuit at a maximum 50°F.
2. Jumper the two ST-800 Sensor lead wires together, activating the freeze protection circuit.

Note: This method does not test the sensor thermal switch.

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1207



Spartemp

Limited Warranty

CALIFORNIA LEGISLATURE APPROVED

1980 SPA AND HOT TUB CONSTRUCTION AND REPAIR ACT

CONSTRUCTION AND REPAIR OF SPAS AND HOT TUBS

CONTRACTORS WHO FAIL TO COMPLY WITH THE REQUIREMENTS OF THIS ACT ARE SUBJECT TO FINES AND PENALTIES.

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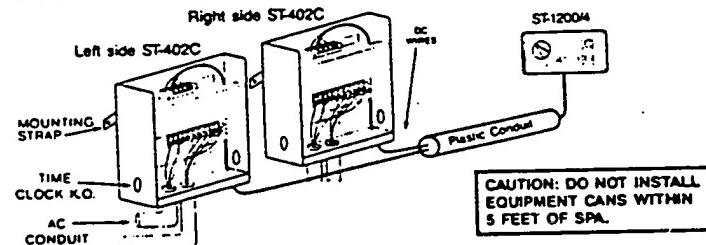
CONTRACTORS WHO FAIL TO COMPLY WITH THE REQUIREMENTS OF THIS ACT ARE SUBJECT TO FINES AND PENALTIES.

CONTRACTORS WHO FAIL TO COMPLY WITH THE REQUIREMENTS OF THIS ACT ARE SUBJECT TO FINES AND PENALTIES.

INSTALLATION NOTES:

INSTALLATION OF EQUIPMENT CANS:

Attach mounting straps to back of cans using two #8 screws supplied. Securely attach cans to vertical surface. Route AC and DC wires as shown for maximum isolation.



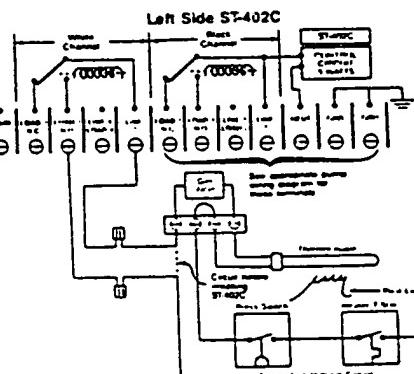
EQUIPMENT WIRING:

The leftside ST-402C WHITE CHANNEL is used for heater hookup. Three installations are shown — millivolt gas, electronic gas, and electric - 6KW and 12KW. Select the correct wiring diagram for your heater and wire accordingly. Next, select the correct pump wiring diagram (single or two speed) and wire accordingly. This will complete your installation of the LEFT SIDE ST-402C. Wire RIGHT SIDE ST-402C for Light (BROWN CHANNEL) and Blower (BLUE CHANNEL) per Blower and Light diagram to complete entire installation.

GAS MILLIVOLT HEATERS

1. Connect ST-402C terminals **IN SERIES** with the heater control circuit as shown, using 18 gauge or heavier wire.
2. Route wires inside heater AWAY from flame or potential hot metal or malfunction may result.
3. Turn UP Heater Thermostat to the maximum desired spa temperature. The remote Spa-Temp ST-12004 Thermostat will control the water temperature UP TO the setting of the heater thermostat, and **WILL NOT** override the heater thermostat.

CAUTION: DO NOT BYPASS OR DISABLE THE HEATER PRESSURE RELIEF THERMOSTAT OR DAMAGE (FIRE) MAY OCCUR.



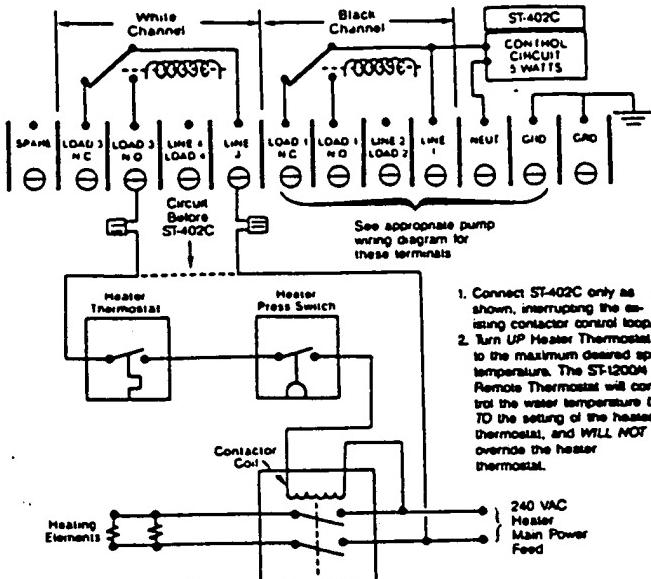
012266

1508

ELECTRIC HEATERS
240V — 8KW and 12KW

CAUTION: DO NOT ROUTE MAIN HEATER LINE POWER THROUGH ST-402C TERMINALS OR YOU MAY DAMAGE THE ST-402C

Left Side ST-402C

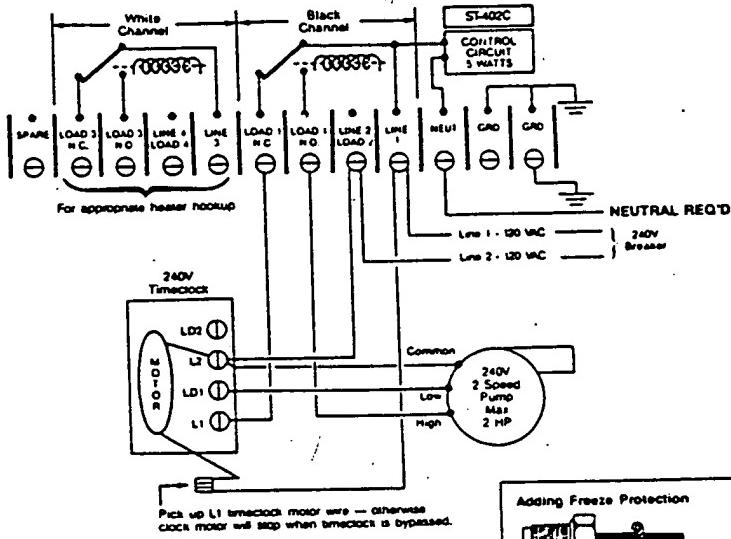


See appropriate pump
wiring diagram for
these terminals

1. Connect ST-402C only as shown, interrupting the existing contactor control loop.
2. Turn UP Heater Thermostat to the maximum desired spa temperature. The ST-12004 Remote Thermostat will control the water temperature UP TO the setting of the heater thermostat, and WILL NOT override the heater thermostat.

**TWO SPEED PUMP
TIMECLOCK CONTROLLED LOW SPEED
BUTTON CONTROLLED HIGH SPEED (BYPASSES TIME CLOCK)**

Left Side ST-402C



240 Volt Shown

For 120 volt pump use 120 volt
timeclock and substitute neutral
for line 2. Max load 1 HP

Adding Freeze Protection

ST-800 Freeze Protector
Connect ST-800 between the
RED and BLACK ST-402C DC
Control Limited Energy Ter-
minals. The ST-800 will turn
ON the pump at 40°F and OFF
at 50°F, just like pushing the
respective ST-12004 push-
button

SPECIAL FREEZE PROTECTION INSTRUCTIONS:

The ST-12004 ON/OFF button can be used to select HEAT or NO HEAT when used with ST-800 Freeze Protector:

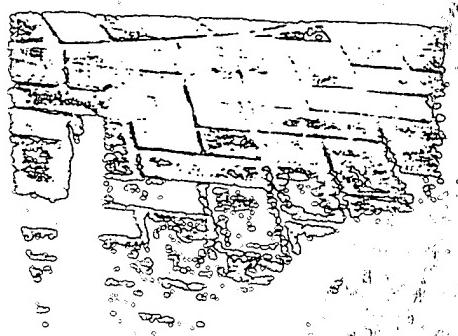
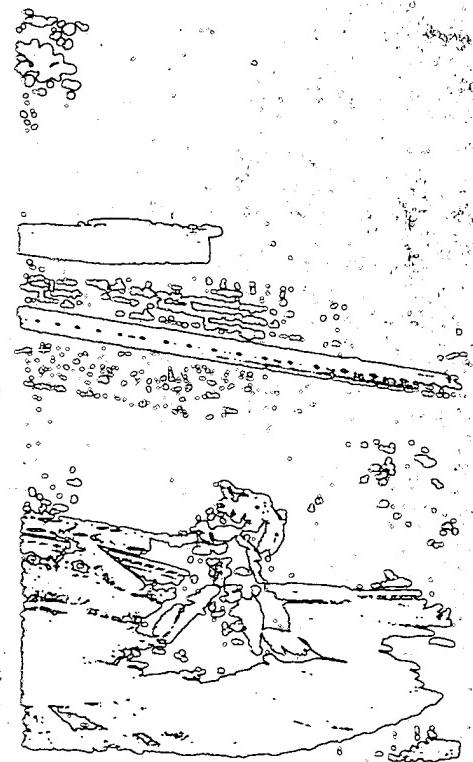
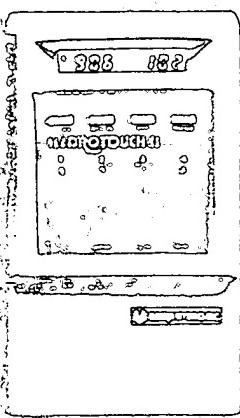
ON/OFF - ON: ST-800 Freeze Protector will turn ON pump and heater. Set ST-12004 ther-
mostat to LOW or higher.

ON/OFF - OFF: Heater inactivated — ST-800 Freeze Protector will only turn ON pump.

012267
1209

Baker Hydro Adds A Touch Of Pure Pleasure
To Pool And Spa Systems.

HIDROTOUCH® II
DIGITAL COMMAND CENTER



Baker Hydro Brings The Convenience And Economy of 7 Day Programmability to Pool And Spa Systems With HYDROTOUCH II

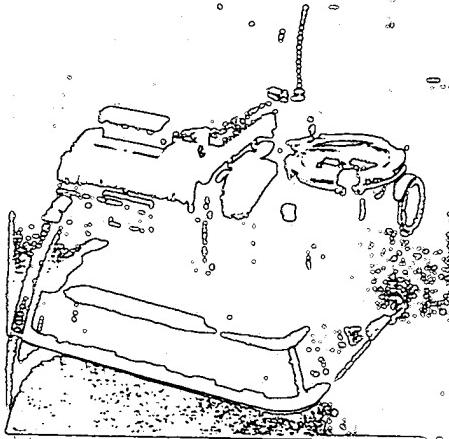
DIGITAL COMMAND CENTER

Microelectronics have changed the way we live and work. Now Baker Hydro is changing the way we play with the revolutionary Hydrotouch II Digital Command Center, the pool and spa control system which makes it possible to program pool and spa operations for maximum efficiency and trouble-free pure pleasure. Using state-of-the-art microprocessor technology, Baker Hydro has developed a control system which allows individual equipment operations to be patterned to conform to the owner's individual lifestyle.

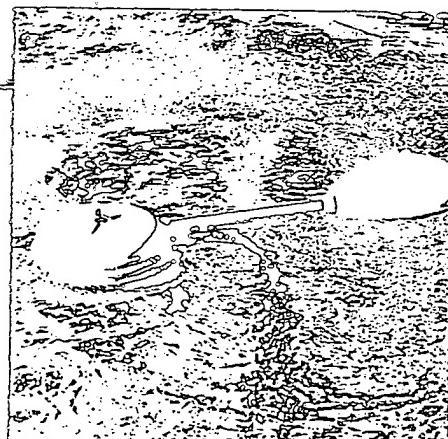
Hydrotouch II incorporates recent advances in microprocessor technology which make the programmed, remote operation of any pool or spa as easy as setting a wake-up time on your clock radio...and the results are far more pleasurable! Pump and heater operations, auxiliary equipment such as pool cleaners, even lights and music can all be programmed in advance to fit the changing patterns of your days and nights.

POOLS

Allows operation of the pump by programmed time or manually. Pump may be programmed for different times than heater for additional filtration.



1
Channels



Allows operation of a pool cleaner or other systems by programmed time or manually. Selectable interlock activates Channel 1 pump automatically.

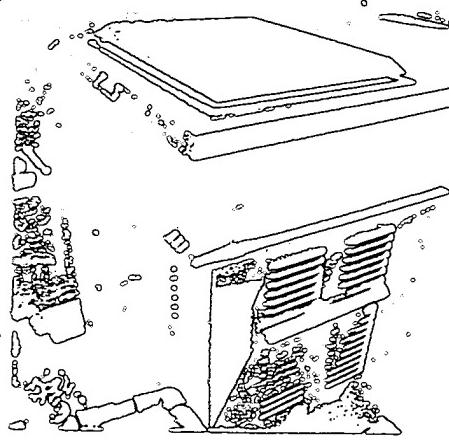
3

Channels

2



Allows operation of the heater by programmed time, programmed temperature, or manually. Heater operation turns Channel 1 pump on and off automatically.



4

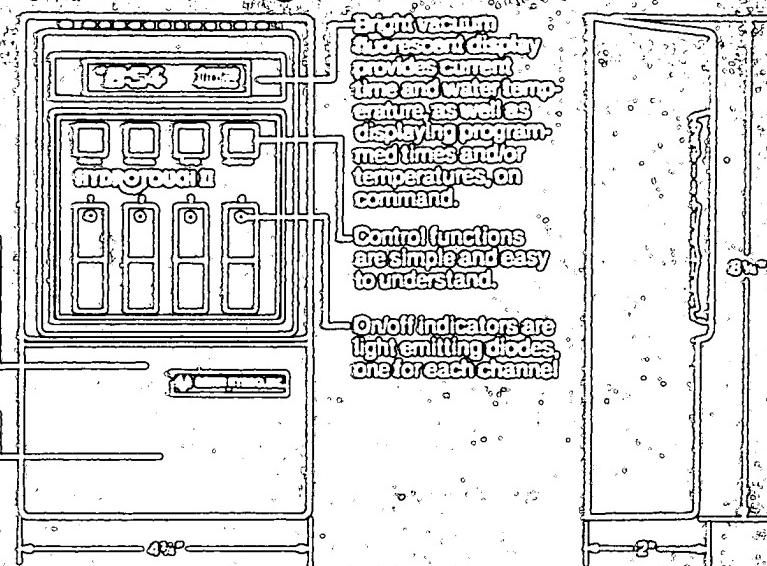
Pool lights or other systems can be set to function by programmed time or manually.

HYDROTOUCHTM

DIGITAL COMMAND CENTER

A 3 position switch allows selection of single or dual function programming and has a lock position to prevent tampering.

A 9 volt battery (not supplied) prevents program erasure during temporary power failures.



Specifications and Ratings

GENERAL

Operating Voltage: 26 VAC \pm 3

Maximum Load Current: 3.0 Amps per channel

Voltage Regulators: 2 - 5.0VDC and 24.0VDC

Internal Clock Frequency: 2.097152 MHz; Crystal

Clock Accuracy: $\pm .00001\%$ (\pm 6 minutes per year)

Operating Temperature: -20° to $+150^{\circ}$ F

TEMPERATURE CONTROL

Sensor: Negative temperature coefficient thermistor

Temperature Control Range: $+40^{\circ}$ to 109° F

Temperature Control Differential: $\pm 2^{\circ}$ F

DISPLAY

Type: Bright vacuum fluorescent

Digits: 4 digits for time of day, with hyphen PM indicator, 3 for temperature readout; simultaneously.

Used for programming hours for "on/off" functions and setting the clock.

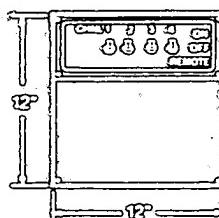
Used for programming minutes for "on/off" functions and setting the clock.

Used for setting desired water temperature.

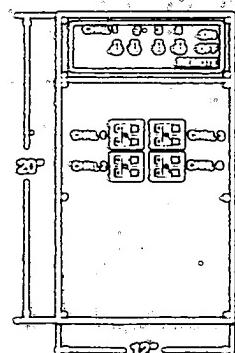
Allows manual operation and the override of any programmed channel.

HYDROTOUCHTM EXTENSION KIT

The HydrotouchTM Digital Command Center is factory equipped with a 50 ft. low voltage connecting cable. Optional extension cables with plugs and connectors installed are available in 25, 50 and 100 ft. lengths to allow remote location at any distance from pool or spa.



*Model HT-100 - includes the HydrotouchTM Digital Command Center and a raintight electric panel containing all required switching and control circuitry for retrofitting to any existing pool or spa.



Model HT-200 - includes the HydrotouchTM Digital Command Center and a raintight electrical panel containing all required switching and control circuitry plus the capability of accepting customer furnished circuit breakers to meet the needs of new pool and spa construction.



BAKER HYDRO MAKES WATER PURE PLEASURE



BAKER HYDRO, INC.
DIVISION OF TOLO INCORPORATED

17152 Armstrong Avenue, Irvine, CA 92711
Telephone (714) 540-6300 / TWX 910-555-2424
1812 Tobacco Road, Augusta, GA 30906

The "Time Machine" from Baker Hydro.

Time spent waiting for your pool or spa to come up to temperature can be frustrating. The Hydrotouch II Digital Command Center from Baker Hydro can give you back that time, while ensuring that your pool or spa is sparkling clean and at the temperature you prefer, whenever you wish to use it.

Hydrotouch II has been designed in such a way that retrofitting the system to any presently existing pool or spa is easy. Or, the system can be "designed in" for new installations. Either way, Hydrotouch II offers pool or spa owners an exciting new dimension - the ability to program all operations to function automatically over a seven day period.

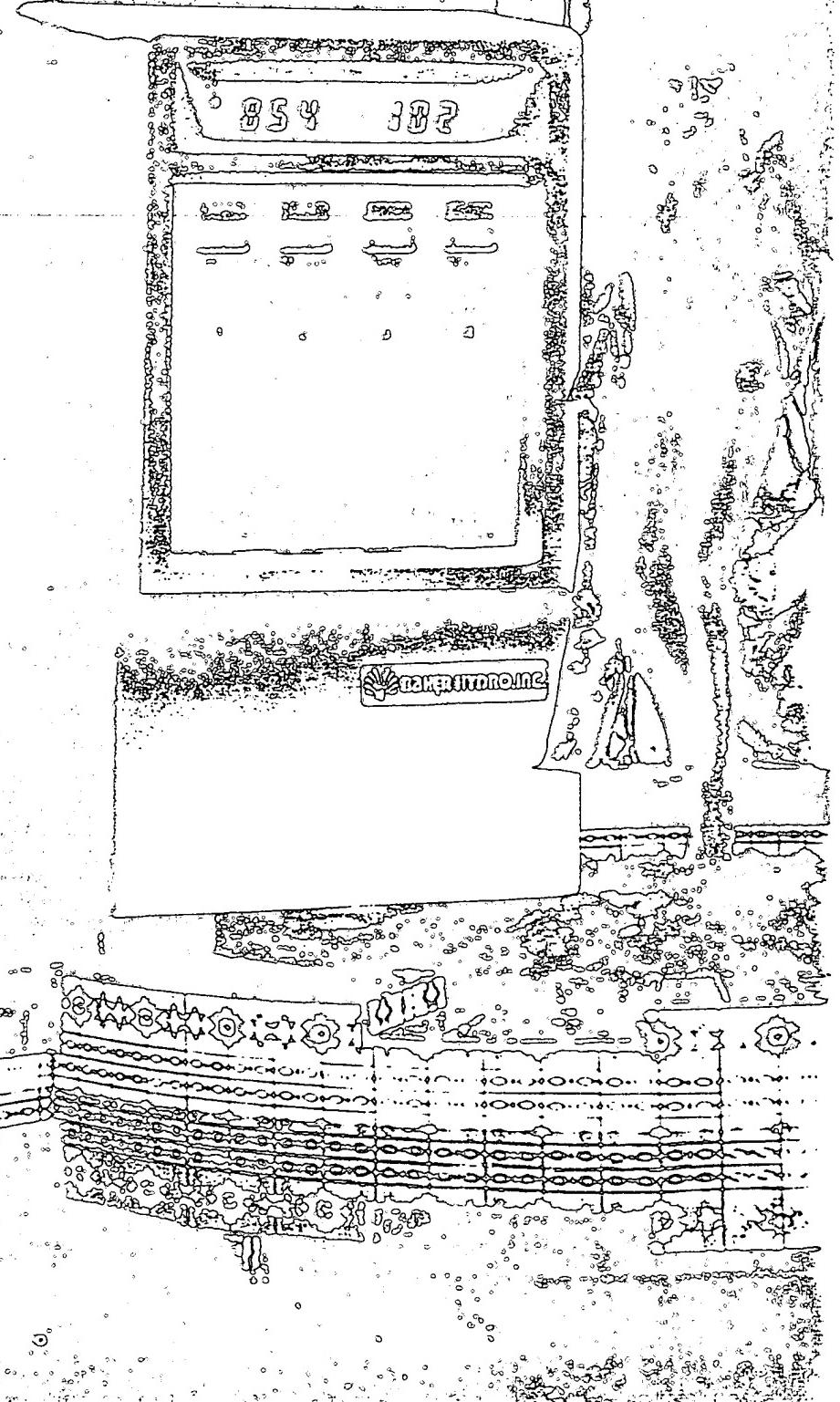
And that's not all.

We're Proving That Time (and Temperature) Is Money.

As energy costs rise, more efficient pool and spa operations become vital. Pumps, heaters and other equipment must be operated economically, while still providing the full fun, relaxation and convenience pool and spa owners have a right to expect. By controlling all system operations at pre-set hours and temperatures around the clock and through the week, Hydrotouch II helps to provide the pure pleasure you

expect from your pool or spa in a setting that's convenient and cost effective. You Can Program 3 Different Operations...

Hydrotouch II can be owner-programmed for one or two complete "on/off" and/or "temperature control" operations per day, each of four separate channels. A convenient switch in the Command Center allows each of



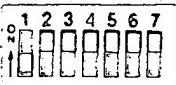
four channels to be individually programmed for one or two functions per day, and includes a lock position which prevents tampering.

...or 7 Different Days

But you're not locked into the same schedule every day of the week. A bank of four (one for each channel) seven-pole day switches enables you to exclude a day or days from the pre-programmed operational pattern by simply moving the appropriate switch to the "off" position.

A "Fail Safe" System Designed To Prevent Costly Errors.

Hydrotouch II incorporates a preprogrammed interlock system between Channels 1 and 2 which automatically activates the pump (Channel 1) whenever the heater (Channel 2) is turned on. A built-in delay ensures that the pump will



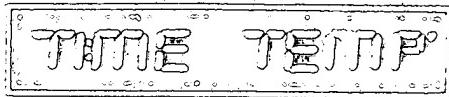
have reached full flow before the heater starts, even though they may have been programmed to begin operation simultaneously. As an additional precautionary measure, the pump will continue operation for a short period after heater shut-off, to avoid retaining potentially damaging hot water within the heater.

And a "Smart Channel" That Lets You Have It Both Ways.

Channel 3 has been provided with a selectable interlock system for use in swimming pools equipped with pool cleaners. When activated, the interlock automatically switches-on the Channel 1 pump whenever the pool cleaner is started. Deactivated, Channel 3 can be operated independently of the Channel 1 pump. This option is designed to enable pool owners without pool cleaners, or spa owners, to utilize Channel 3 without interference from

the interlock system. Should a pool cleaner be added later, the interlock can be easily activated.

Information From The Source.



Hydrotouch II's bright vacuum fluorescent display gives you current information on time and water temperature. Should you forget your schedule the Command Center will display all programmed operational times and temperatures on command. It's your complete source of spa or poolside information that can be installed at any convenient location in your home.

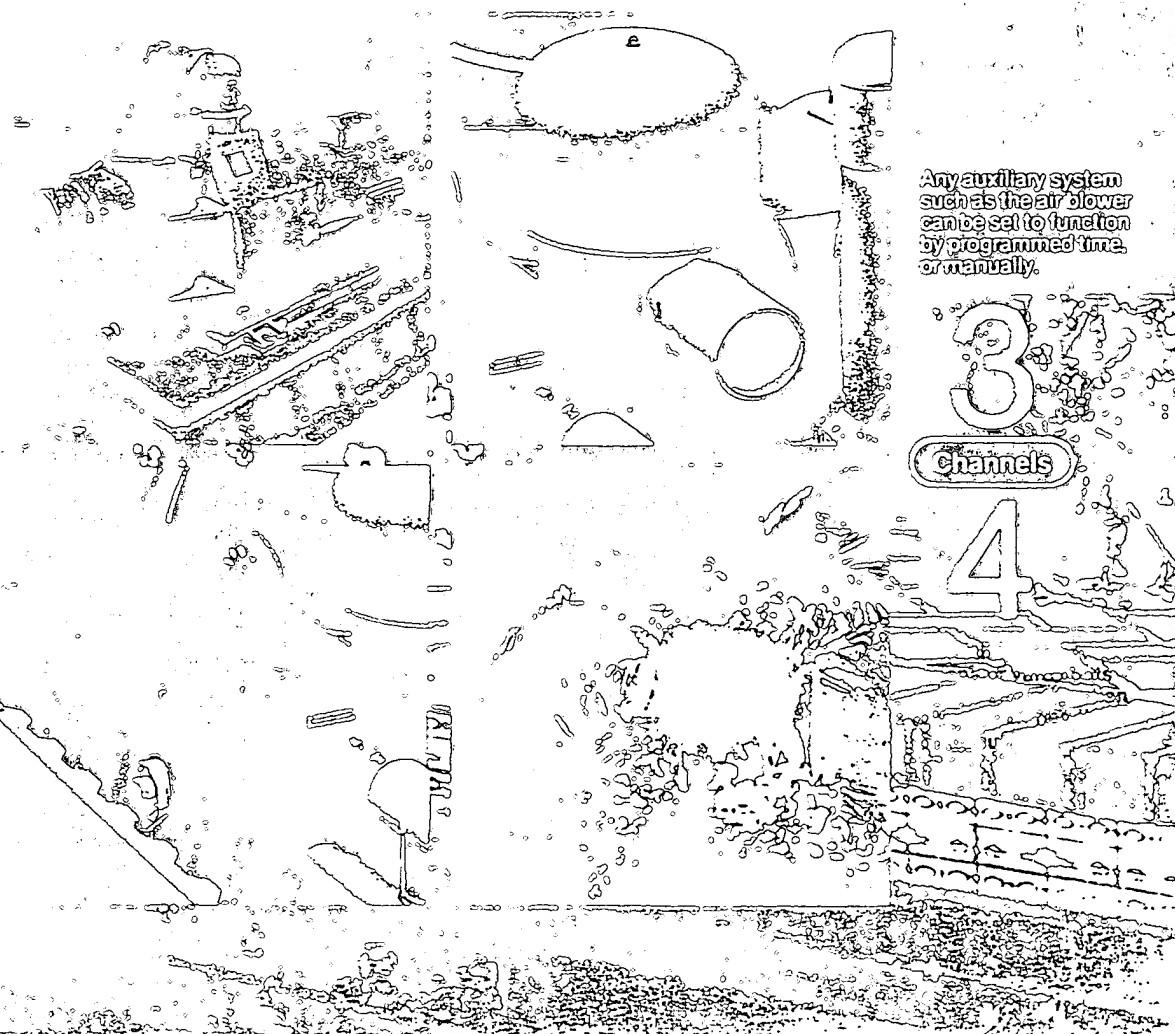
SPAS

Allows operation of the pump by programmed time or manually. Pump may be programmed for different times than heater for additional filtration.

1

Channels

2



Any auxiliary system such as the air blower can be set to function by programmed time, or manually.

3

Channels

4

PURE
PLEASURE
HAS NEVER
BEEN MORE
CONVENIENT.



Sentra

100

-701- SERIES -724-

Sundance
Spas®

000470

671

EXHIBIT

B

INSTALLATION & OWNERS M

Part #6530-700 • Revised 6/90 • © 1988 Clark Mfg., Inc.

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672

The Sentry 700 Series Controls: 701 and 724

Reliable, accurate and easy to use, the Sentry 700 Series controls are the most advanced spa controls available. The 701 and 724 controls are very similar systems. The 724 systems have pumps with greater horsepower and only operate on 240 volts. The 701 systems can be operated on 120 volt (1.5 kilowatt heater) or 240 volt (6 kilowatt heater).

Important Spa Owner Information

Your Sundance Spa is constructed of the highest standards and is capable of providing many years of trouble-free use. However, because heat retentive materials are utilized to insulate the spa for efficient operation, an uncovered spa surface directly exposed to sunlight and high temperatures for an extended period is subject to permanent damage. Damage caused by exposing the spa to this abuse is not covered by warranty. We recommend that you always keep the spa full of water when it is exposed to direct sunlight and that you keep the Sundance insulating cover in place at all times when the spa is not in use.

Read and carefully follow the requirements for your spa's support base (found in the section titled, "Locating Your Sundance Spa").

Your Sundance spa is designed to accept the SunZone Water Purification System. Use of any other ozone system will invalidate the spa's warranty.

FCC Warning

This equipment generates and uses radio frequency and if not installed and used properly, that is, in strict accordance with the manufacturer's instruction, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a class B computing device in accordance with the specifications in subpart J of part 15 of the FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference, which can be determined by turning the equipment on and off, the user is encouraged to try to correct the interference by one or more of the following measures: • Reorient the receiving antenna • Relocate the receiver with respect to the spa. • Move the receiver away from the spa. • Plug the receiver into a different outlet so that the receiver and spa are on different branch circuits. • If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. • The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to identify and resolve radio-TV interference problems." This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 004-000-00345-4.

**REQUIRED INSTRUCTIONS UL NO. 1563
SENTRY™ 700 SERIES EQUIPPED SUNDANCE SPAS
OWNERS MANUAL**

Important Safety Instructions

When installing and using this equipment, basic safety precautions should always be followed, including the following:

- 1. READ AND FOLLOW ALL INSTRUCTIONS BEFORE OPERATING THE SPA!**
- 2. DANGER — To reduce the risk of injury, do not permit children to use this product unless they are closely supervised at all times.**
- 3. WARNING — RISK OF CHILD DROWNING. Extreme caution must be exercised to prevent unauthorized access by children. To avoid accidents, ensure that children cannot use a spa or hot tub unless they are supervised at all times.**
- 4. DANGER — To reduce the risk of injury, do not remove the main drain suction grate or cover.**
- 5. DANGER — A wire connector marked "ground" is provided within the power box (See ILL. 1.4). To reduce the risk of electric shock, connect this terminal or connector to the grounding terminal of your electrical service or supply panel with a continuous green insulating copper wire equivalent in size to the circuit conductors supplying this equipment, but no smaller than No. 8 AWG. In addition, a second wire connector is provided for bonding to local ground points. To reduce the risk of electrical shock, this connector should be bonded with a No. 8 AWG (8.4 MM²) copper wire to any metal ladders, water pipes, or other metal within five feet (1.52 m) of the spa.**
- 6. DANGER — RISK OF ELECTRICAL SHOCK, Install at least five feet (1.52 m) from all metal surfaces.**

(A spa may be installed within five feet of metal surfaces, if in accordance with the National Electrical Code, ANSI/NFPA 70-1984, each metal surface is permanently connected by a No. 8 AWG (8.4 mm²) copper conductor attached to the wire connector on the terminal box that is provided for this purpose.)
- 7. CAUTION — Sentry 724 connected to 240V and Sentry 701 connected to 120V or 240V must be hardwired to your household electrical service box only. Do not use an extension cord or any other disconnectable power cord. The use of an extension cord or a disconnectable power cord is highly dangerous and will void all warranties!**

8. INSTALLATION — The spa must be installed in such a manner as to provide drainage of the compartment for electrical components.
9. DANGER — RISK OF ELECTRICAL SHOCK. Do not permit any electric appliance, such as a light, telephone, radio, or television, within 5 feet (1.52 m) of the spa.
10. The water in a spa or hot tub should never exceed 40° C (104° F). Water temperatures between 38° C (100° F) and 40° C (104° F) are considered safe for a healthy adult. Lower water temperatures are recommended for extended use (exceeding 10 - 15 minutes) and for young children.
11. Since excessive water temperatures have a high potential for causing fetal damage during the early months of pregnancy, pregnant or possibly pregnant women should limit spa or hot tub water temperatures to 38° C (100° F).
12. Before entering a spa or hot tub, the user should measure the water temperature with an accurate thermometer since the tolerance of water temperature-regulating devices may vary as much as $\pm 3^\circ$ C (5° F).
13. The use of alcohol, drugs, or medication before or during spa or hot tub use may lead to unconsciousness with the possibility of drowning.
14. Persons suffering from obesity or with a medical history of heart disease, low or high blood pressure, circulatory system problems, or diabetes should consult a physician before using a spa or hot tub.
15. Persons using medication should consult a physician before using a spa or hot tub since some medication may induce drowsiness while other medication may affect heart rate, blood pressure, and circulation.
16. The electrical supply for this product must include a suitably rated switch or circuit breaker to open all ungrounded supply conductors to comply with Section 422-20 of the National Electrical Code, ANSI/NFPA 70-1987. The disconnecting means must be readily accessible to the spa's occupant but installed at least 5 feet (1.5 m) from spa water.
17. Always enter and exit the spa slowly and cautiously. Wet surfaces will be slippery.
18. Long exposures in the spa may result in nausea, dizziness or fainting. Observe a reasonable time limit, leave the spa, then shower, cool down and, if you wish, return for another brief stay.

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19. Do not use the spa alone.
20. It is recommended that the following emergency telephone numbers be listed at the nearest telephone: physician, hospital, ambulance and police.
21. Excessive temperatures may cause hyperthermia. The symptoms and first aid information are as follows:

HEAT STROKE: The most susceptible people are the very young and elderly, alcoholics and most people under the influence of drugs, medication and alcohol.

SYMPTOMS: Hyperthermia causes loss of salt, sweating, ordinary dizziness, headache, dryness of mouth and nausea, faintness and/or unconsciousness, convulsions, flushed appearance of skin and rapid pulse and/or weak, shallow breathing.

TREATMENT: Place the victim on his back, head slightly elevated. Apply wet cloths or ice packs to the head, wrap the body in a sheet, pouring on a small amount of water. Follow with a cool shower or bath. Get medical attention as soon as possible.
22. SAVE THESE INSTRUCTIONS!

Locating Your Sundance Spa

IMPORTANT: Because of the combined weight of the spa, water and users, it is extremely important that the base upon which the spa rests be smooth, flat and capable of uniformly supporting this weight, without shifting or settling for the entire time the spa is in place. If the spa is placed on a surface which does not meet these requirements, damage to the skirt and/or the spa shell may result. Damage caused by improper support is not covered under warranty. It is the responsibility of the spa owner to assure the integrity of the support over time.

We recommend a poured, reinforced concrete slab (minimum of 4 inches thick). Wood decking is also acceptable provided it is constructed so that it meets the requirements outlined above.

The spa must be installed in such a manner as to provide drainage away from the spa. Placing the spa in a depression without provisions for proper drainage could allow rain, overflow and other casual water to flood the equipment and create a wet condition in which the spa would sit.

For spas which will be recessed into a floor or deck, install so as to permit access to the equipment, either from above or below, for servicing. Make certain that there are no obstructions which would prevent removal of the cabinet side panels, especially on the side with the equipment bay doors.

In selecting the ideal *outdoor* location for your spa, we suggest that you take into consideration, 1) the proximity to change areas and shelter (especially in colder weather); 2) the pathway to and from your spa (this should be free of debris so that dirt and leaves are not easily tracked into the spa); 3) the closeness to trees and shrubbery (remember that leaves and birds could create extra work in keeping the spa clean); 4) a sheltered environment (less wind and weather exposure can result in lowered operation and maintenance costs); and 5) the overall enhancement of your environment. It is preferable not to place the spa under an unguttered roof overhang since run-off water will shorten the life expectancy of the spa cover.

For *indoor* installations, be certain to make provisions for proper ventilation. When the spa is in use, considerable amounts of moisture will escape. This can damage certain surfaces over time.

If you have any questions regarding the placement or installation of your spa, consult your authorized Sundance Dealer.

General Electrical Safety Instructions

Your new Sundance Spa is equipped with the "state-of-the-art" Sentry" equipment system. It contains the most advanced safety and self-protective equipment in the industry. Nonetheless, this spa must be installed properly to insure dependable usage. Please contact your dealer or local building department should you have any questions regarding your installation. In the event they are unable to answer your questions, direct your inquiries to Sundance Spas. Please refer to the back of this manual for our address and telephone number.

Proper grounding is extremely important. Sundance Spas are equipped with a current collector system. A pressure wire connector is provided on the surface of the control box, located inside the equipment door (See ILL. 1.4, ITEM 3) to permit connection of a bonding wire between this point and any ground metal equipment, metal water pipe or conduit within 5 feet of the spa, or copper clad grounding rod buried within 5 feet of the spa. Bonding wire must be at least No. 8 AWG (8.4 mm²) solid copper wire. This is a most important safety assurance feature.

Before installing the spa, check with the local building department to insure installation conforms to local building codes.

DOOR INTERLOCK

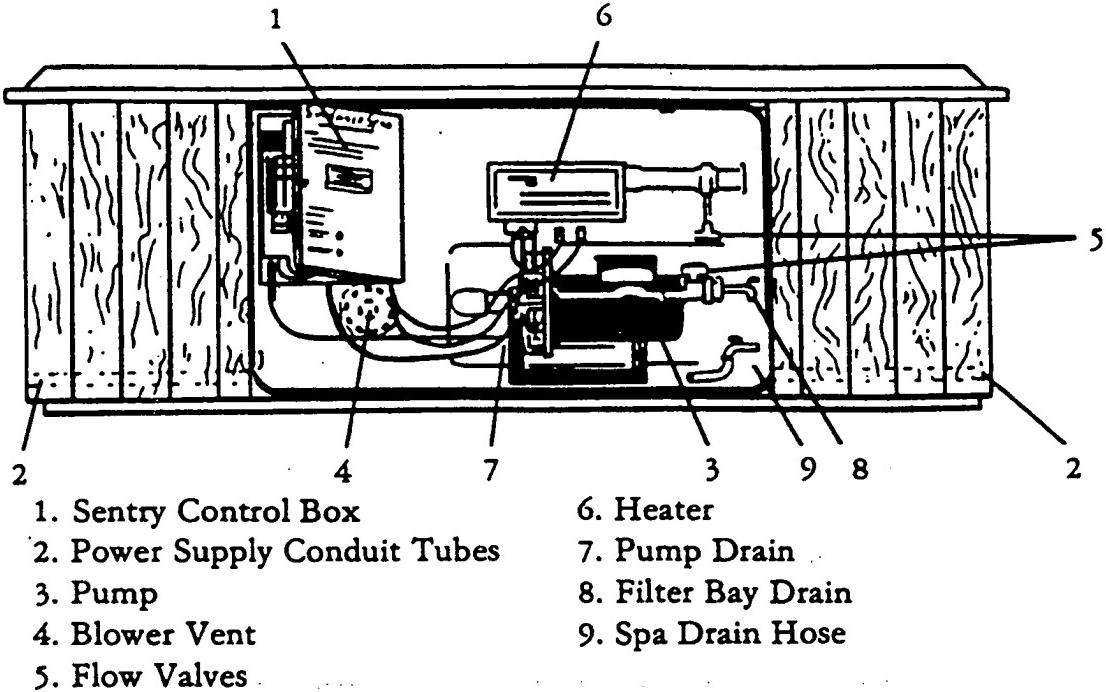
The Sentry™ 700 Series equipped Sundance Spa contains a door interlock on each door to shut down the power supply to the high voltage electrical components when the door is opened.

NOTE: Polarity indicator lights and low voltage circuitry will continue to function when the door is opened.

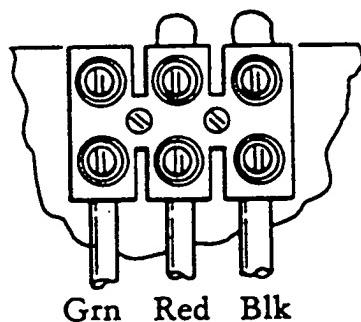
POLARITY INDICATOR LIGHTS

The polarity indicator lights allow for a visual inspection of your electrical installation. On the control box, located behind the equipment door, are two neon lights that are used to identify proper electrical hook up. (See ILL. 1.4, ITEM 2). The upper light indicates ground circuit, the lower light indicates line/load circuit. Check to see that both lights are brightly ON before operating the spa. Should either or both lights flicker, dim, or fail to come on when spa is energized, the spa is not properly installed. This condition must be corrected before the spa can be used.

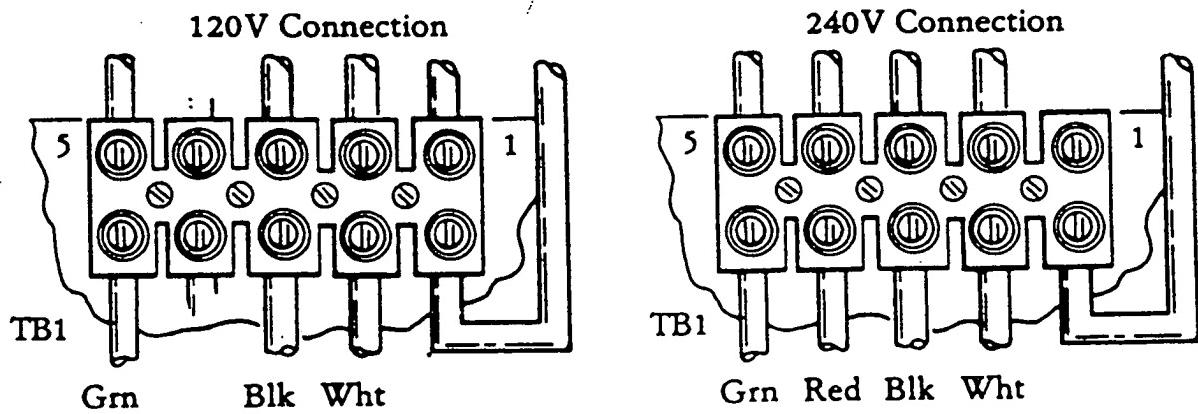
ILL No. 1.1
Equipment Bay



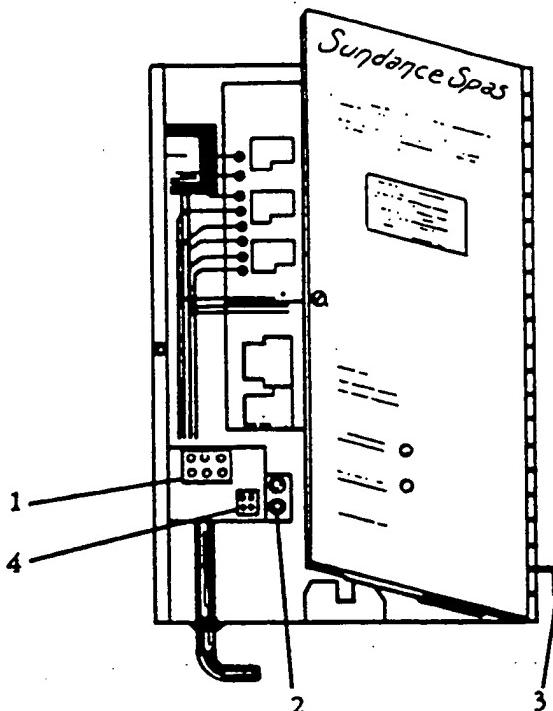
ILL. No. 1.2
724 Terminal Strip (240V)



ILL. No. 1.3
701 Terminal Strip (120V/240V)



ILL. No. 1.4
Sentry Control Box



1. Terminal Strip
2. Polarity Indicator Lights
3. Grounding Lug
4. Receptacle for Optional Ozone Purification System

Electrical Installation Instructions for Sundance 700 Series Spas

IMPORTANT NOTICE: The electrical wiring of this spa must meet the requirements of the National Electrical Code (NEC) and any applicable state or local codes. The electrical circuit must be installed by a qualified electrician and approved by a local building/electrical inspection authority.

1. This spa must be permanently connected (hard-wired) to the power supply. No plug-in connections or extension cords are to be used in conjunction with the operation of this spa. Supplying power to the spa which is not in accordance with these instructions will void both the U.L. listing and the manufacturer's warranty.
2. The power supplied to this spa *must* be a *dedicated* circuit with no other appliances or lights sharing the power provided by the circuit.
3. To determine the current, voltage and wire size required for the spa and configuration to be connected, refer to the power supply chart (ILL. No. 2).
 - We recommend type THHN wire.
 - Wire size must be appropriate for the distance of the wire run per NEC.
 - All wiring must be copper to ensure proper connections. Do not use aluminum wire.
 - When using wire larger than #6, add a "J" box near the spa and reduce to short lengths of #8 wire to connect to the spa.

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4. To gain access to the spa's power terminal strip, unlock and slide open the left door of the spa's equipment bay. Then open the door to the control box. (See ILL. 1.1, ITEM 1).
5. Feed cable through the power supply conduit tubes provided and install cable through connector.
6. Connect wires, color to color, on terminal strip TB1 (See ILL. 1.2 for 724, ILL. 1.3 for 701). TIGHTEN SECURELY! All wires must be hooked up or damage could result.

IMPORTANT: FOR 120V OPERATION OF 701 SPAS, the following modifications must be made in order for the spa to operate properly:

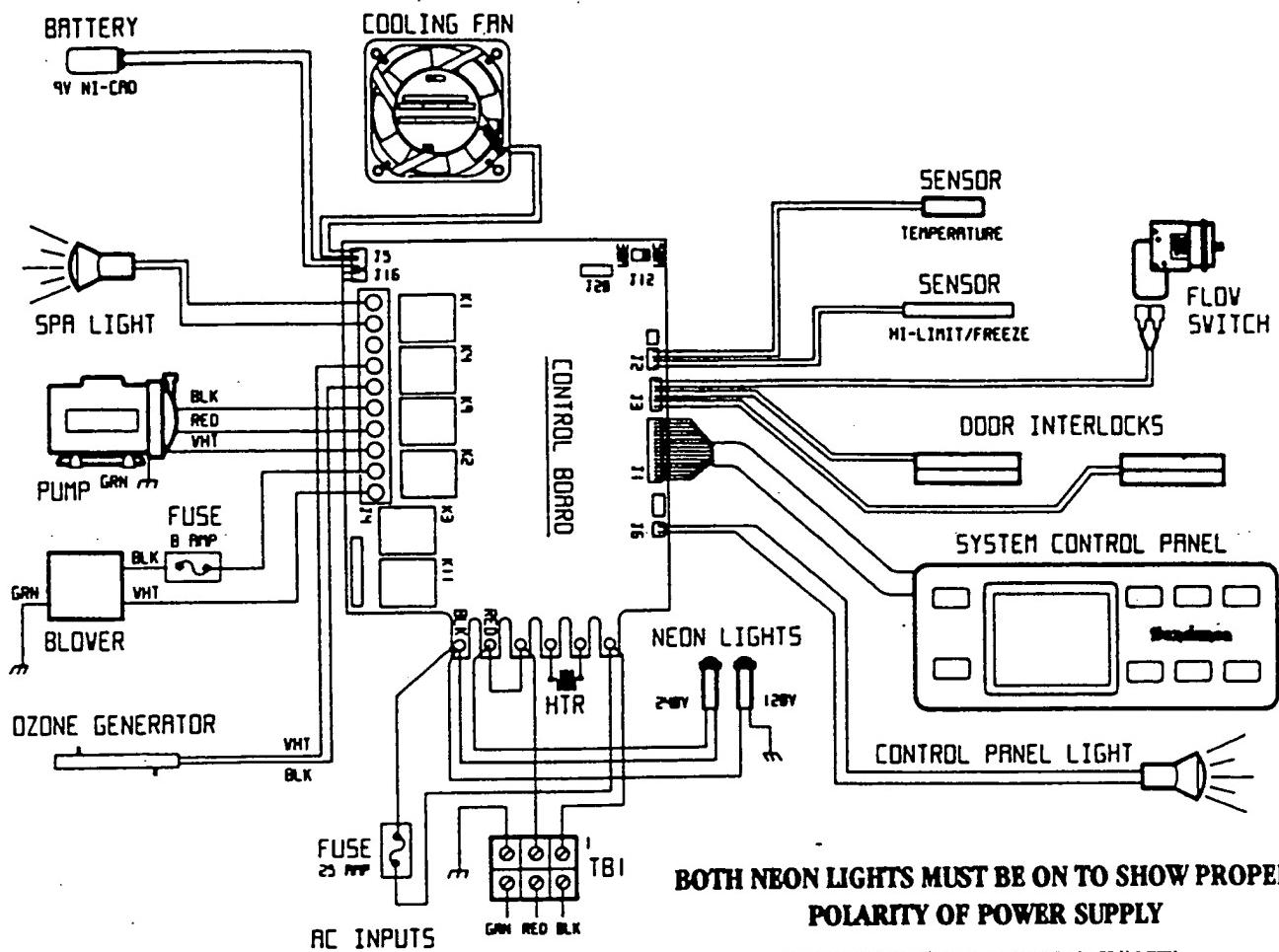
- A.) Move the red wire at TB1-4 to TB1-1 (See ILL. 3), and
- B.) Move the circuit board jumper J12 from 50A to 30A position (See ILL. 3).

7. To provide an extra measure of safety, we recommend that a separate #8 solid copper ground wire be connected between the spa current collectors (grounding lug on the right side of the control box) and a local UL-recognized ground rod fully driven into the ground.
8. At this point you should be ready to check for proper polarity. Leaving one of the equipment bay doors open to prevent the pump from coming on, turn on the breaker to the spa circuit. Both indicator lights on the Sentry control box should come on brightly (SEE ILL. 1.4, ITEM 2). The upper light indicates the ground circuit and the lower light indicates the line/load circuit. Both lights must be brightly lit to ensure that the electrical safety systems will function. If neither light is on, check to see that power is being supplied to the system. If the lights still fail to light, or if only one lights, there is an error in the electrical supply. Disconnect power immediately and correct the problem.

**ILL. No. 2
POWER SUPPLY REQUIREMENTS**

	724 240V only	701 240V	701 120V
Circuit Breaker	50A dual pole	50A dual pole	30A single pole
Number of Wires	3	4	3
Current draw (amps)	40	40	24

ILL. No. 3
Sentry™ 724 Wiring Diagram



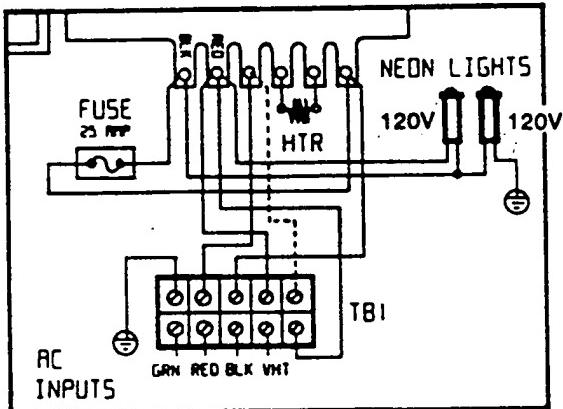
BOTH NEON LIGHTS MUST BE ON TO SHOW PROPER POLARITY OF POWER SUPPLY

**LOWER LIGHT "ON", UPPER LIGHT "OFF":
"NO CHASSIS GROUND"**

**UPPER LIGHT "ON", LOWER LIGHT "OFF":
"(RED) POWER LEAD IS NOT CONNECTED"**

**UPPER & LOWER LIGHT BOTH OFF:
"(BLK) POWER LEAD IS NOT CONNECTED"
OR "SYSTEM FUSE BLOWN" OR "NO POWER"**

ILL. No. 3.1
Sentry™ 701 System Wiring Diagram



TO CONVERT 240V TO 120V:

1. Move jumper J12 from 50A to 30A position
2. Move Red Wire at (TB1-4) to (TB1-1) as shown by dashed line.

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Start Up Instructions

CONGRATULATIONS! You are now all set to get your new spa ready to use. Simply follow this step-by-step procedure and, before long, you will be enjoying your first glorious experience in your Sundance Spa.

FOR BEST RESULTS, read each step in its entirety before proceeding with that step.

1. FILL THE SPA

Clear all debris from the spa and fill with water from a garden hose. As the spa is filling, check the plumbing connections inside the equipment bay to see that there are no leaks. Occasionally, it may be necessary to tighten one of these fittings as they can loosen during shipping. Continue to fill the spa until the water level is midway in the skimmer opening and above all jets.

NOTE: Never fill with water exclusively from a water softener. If your water is extremely "hard," it is preferable to fill half-way with hard water and the rest of the way with softened water.

2. TURN ON POWER

Initiate power to your spa by turning on the household circuit breaker installed for the spa. *Be certain that the equipment bay doors are fully closed.*

3. INITIATE WATER CIRCULATION

When power is first supplied to your spa, a variety of messages will appear on the control panel's screen, some of which are flashing. By following this step-by-step procedure, the meaning and use of each will become clear to you.

If the water used to fill your spa is below 80° F., you will notice that the large message in the center of the screen alternates between displaying the word "cool" and the actual water temperature.

If your fill water is above 80° F., press the sensor marked  . You will notice that the low speed pump is on and that the water is gently circulating over the skimmer and through the jets.

NOTE: If this is not the case, check the two flow valves in the equipment bay (See ILL. 1.1 ITEM 5) to be sure that they are open. IF the water is still not circulating, press the sensor pad labeled JETS to activate the high speed pump. Once the water is flowing from the jets, press the sensor again to cycle the pump back to low speed.

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4. SET TIME OF DAY

Notice that one of the messages flashing on the screen instructs you to "set time." To accomplish this, follow this simple 3-step procedure:

Step 1. To enter the "set time" mode, press the following sensors within 3

seconds of each other:  then 



Step 2. To set the time of day, press  or  . After either pad is pressed once, the time of day will advance or decrease automatically in one minute increments, beginning slowly, then more rapidly. Press either pad again to stop the display's time setting cycle. Note the AM/PM display.

Step 3. To exit the "set time" mode once the correct time of day has been

set, press  . At this point the only messages flashing should be the current water temperature and the word "cool."

5. SET DESIRED TEMPERATURE

Your Sentry™ 700 Series controls have been pre-programmed to automatically achieve a water temperature of 100°F. which is typically the preferred temperature for comfortable enjoyment of a spa. However, if you prefer a different temperature,

simply press either  or  to display the temperature which has been set. Notice that the message "set heat" is displayed. Then, each time either of these pads is pressed again (within three seconds), the set temperature will increase or decrease, depending on which pad is pressed. Continue pressing the appropriate pad until the desired set temperature has been reached.

NOTE: the maximum temperature for which the spa can be set is 104° F., and the minimum is 80° F.

After three seconds, the screen will automatically return to displaying the actual spa water temperature. Anytime you need to check the thermostat setting, simply press

either  or 

NOTE: Setting the thermostat at maximum will not accelerate the heating process. This will only result in a higher ultimate temperature.

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6. FILTER CYCLES

Proper filtration is a major key to maintaining the clarity of your spa water. The Slipstream™ filter system is designed for unsurpassed effectiveness at removing debris and suspensions from the water anytime the water is circulating.

To ensure filtration, your spa should be programmed to operate for approximately two (2) hours twice a day (more for heavy use). You can decide whether or not you want it to heat during these filtration cycles.

Pre-Set Filter Cycles

Your spa is pre-programmed to automatically filter itself for a two (2) hour period every twelve (12) hours. If left unchanged, the first filtration cycle (Filter 1) will operate from 2:00 a.m. to 4:00 a.m., and the second filtration cycle (Filter 2) from 2:00 p.m. to 4:00 p.m. During each of these cycles, the heater will operate as called for by the temperature setting.

These preset filter cycles are suitable for most spa owners' needs. However, you may determine that you would prefer filter cycles at times other than the pre-set times, or different durations, or to leave the heater off during either or both of the filter cycles. If so, refer to the section titled "Changing the Filter Cycles" on page 17.

7. ADD START-UP CHEMICALS

Now it's time to take a break from the controls and add the recommended start-up chemicals. Carefully follow the directions supplied to you by your dealer. If you have any questions, contact your dealer for clarification. General water quality maintenance guidelines are given beginning on page 23.

8. SET SPA TO HEAT

Your spa can be programmed to operate in either the "standard or "economy" mode by simply pressing the mode pad  . The screen will indicate the mode selected.

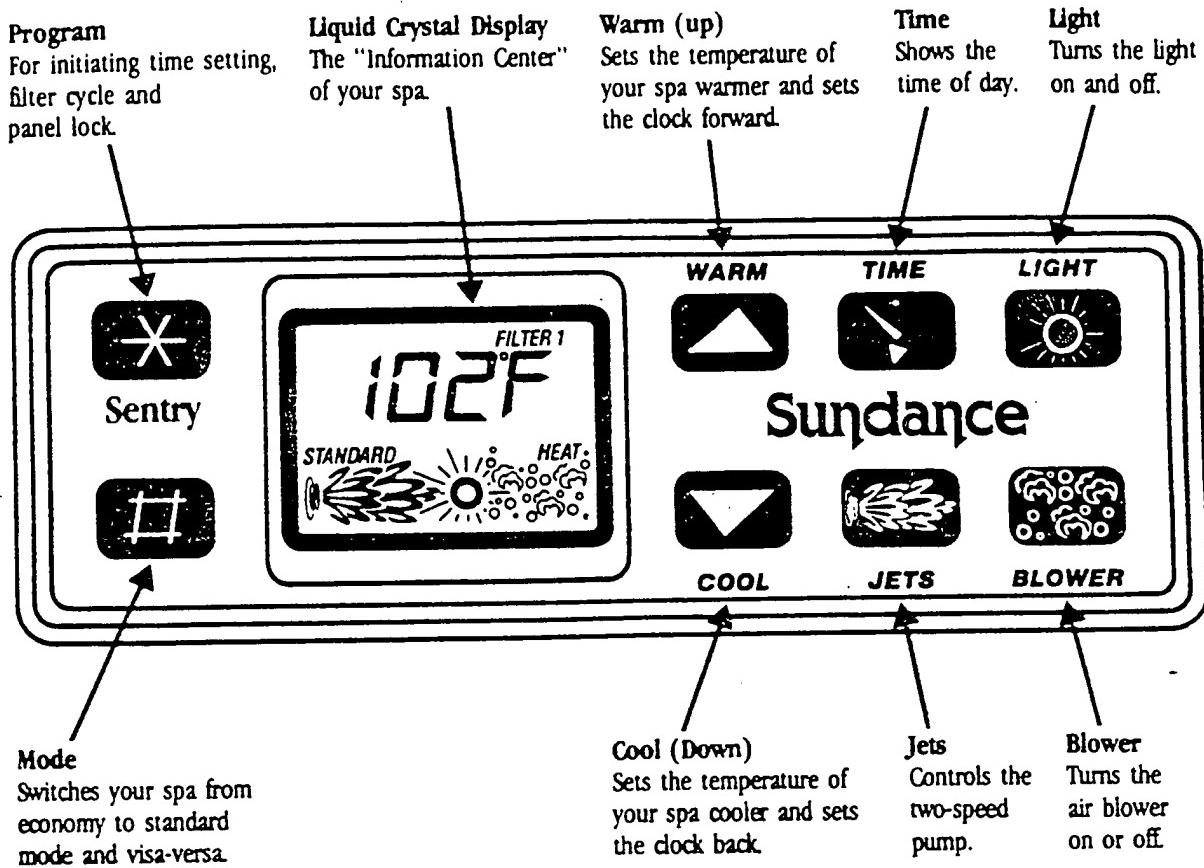
Our recommendation for initial start-up is to set your controls to operate your spa in the "standard" mode until the desired temperature is achieved, then switch to the "economy" mode.

NOTE: for further discussion of these modes, see page 19.

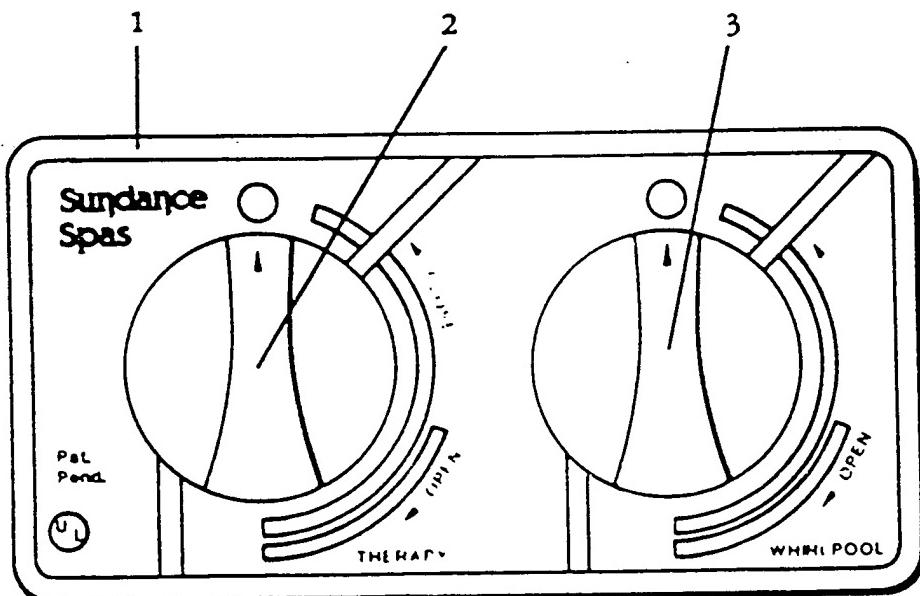
The time required for initial heat-up will vary depending on the temperature of the water used to fill the spa. The temperature will rise approximately five to six degrees per hour.

Sentry 700 Series

The Ultimate Spa Controller



ILL. No. 4.2
Air Control Panel



1. Air Control Panel
2. Therapy Air Control Knob
3. Whirlpool Air Control Knob

Operating Instructions

The Sentry™ 700 Series has a touch sensitive control panel and air control knobs located on the top lip of the spa (See ILL. 5, ITEM 1). These control panels let you operate many of the special functions of your Sundance Spa.

LIGHT

The sensor pad designated "Light" activates the underwater light when touched. The control panel screen will display a light symbol when the light is activated. There are two color lenses included with your spa which may be placed over the light lens.

CAUTION: Do not allow a colored light lens which is not in use to rest on the surface of a Rovel-surfaced spa, as permanent staining can result.

JETS AND AIR INJECTION

The "Jets" and "Blower" functions are controlled the same way. The sensor marked "Jets" controls the hydrotherapy jets (located in the seatback areas), and a sensor marked "Blower" controls in the air injectors (found on the seat tread areas).

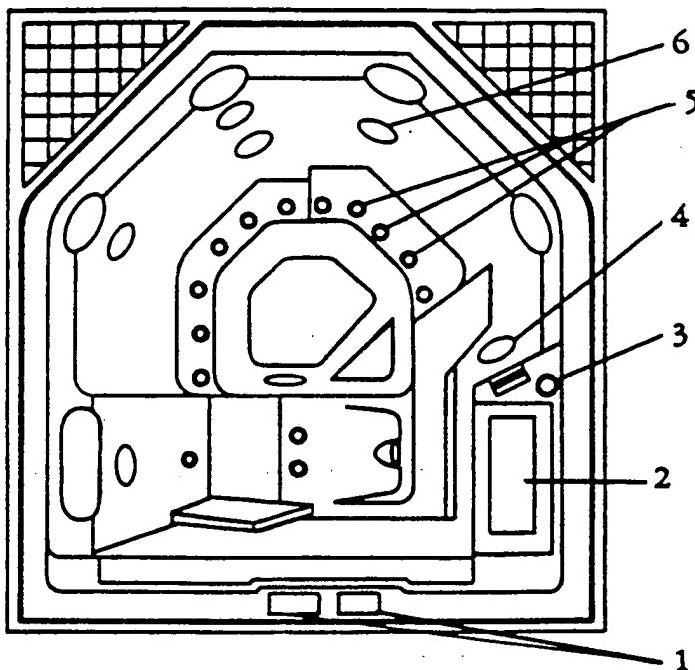
Indicator symbols on the display signal when these functions are on. The "jets" cycle in low, high and off functions. The "air" cycles on and off. Both of these functions are also controlled by an electronic timer which will automatically shut these functions off approximately 15 to 20 minutes after they are started. This is a self-protective mechanism designed to insure the spa cannot be accidentally allowed to run while not in use. To restart, simply depress the sensor.

You will note that occasionally, when the "jet" sensor is cycled off, the jets are continuing to operate at low speed. This happens when the thermostat is calling for heat or when the time clock is on.

AIR CONTROLS

When operating the therapy jets or the whirlpool jet, you may regulate the amount of air that is mixed with the water by adjusting the appropriate air control knob.

ILL. No. 5
Top View - Spa



1. Control Panels
2. Filter
3. Whirlpool Knob
4. Whirlpool Jet
5. Air Injectors
6. Therapy Jets

THE WHIRLPOOL JET

All Sundance Sentry™ 700 Series spas come equipped with a whirlpool jet. The control for this jet is a large, dark grey knob (See ILL. 5, ITEM 3) located next to the filter lid. By turning this knob clockwise, you may direct the flow to the whirlpool jet, counterclockwise rotation directs the flow to the hydrotherapy jets.

IMPORTANT: ALWAYS CYCLE THE JETS OFF OF HIGH SPEED BEFORE ATTEMPTING TO ROTATE THIS KNOB.

CHANGING THE FILTER CYCLES

It is possible to change three (3) aspects of each of the two filter cycles. You may change the time of day at which they start, the time of day at which they stop, and you may elect whether or not you want the heater to operate during either or both cycles. With experience, you will determine the ideal operation for your needs.

For example, if you establish a pattern of regularly using your spa around the same time of day or night, you will probably find it desirable to program a filter cycle so that the spa operates both before and after use. In this way, you are assured that the spa is properly heated when you are ready to use it and that it is adequately filtered after use.

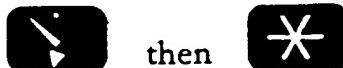
In this example, let's assume you generally use your spa for about thirty (30) minutes around nine o'clock each night. You would, then, set the "Filter 2" cycle to operate each night from around 8:30 p.m. to 11:30 p.m.

An added benefit to this timing of the filter cycle is that your spa's sanitation level, from the bromine in the "Brominator" or the ozone from the optional "Sunzone" system, is at its highest operating level when it is needed most.

Follow these simple procedures to change the filter cycle programming.

To enter into the filter cycle programming function:

Step 1. PRESS the following pads within three seconds of each other.



Step 2. then, PRESS  again.

The panel is now in the filter cycle programming function and across the top of the screen is displayed the message "Set Start Filter 1." At this point, you are ready to adjust the start time for the first filter cycle.

Each subsequent time the program pad  is pressed, you will advance through the following sequence of adjustable functions:

FILTER CYCLE PROGRAMMING SEQUENCE

 Filter 1 Start Time

 Filter 1 Heater On or Off

 Filter 1 Stop Time

 Filter 2 Start Time

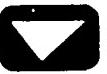
 Filter 2 Heater On or Off

 Filter 2 Stop Time

 Exit filter cycle program function, return to normal functioning.

At any point, you may press the mode pad  to exit the filter cycle programming function and return to normal functioning.

To Set Start Time for Filter Cycle 1

Press either  or  once. The time display will advance slowly at first, then more rapidly. To stop the display from advancing or decreasing, simply press either sensor again. Remember to notice the AM or PM notation displayed on the screen.

Heater On/Off During Filter Cycle

When the filter cycle programming function is cycled to the "heater on/off" setting mode as described in the sequence above, you will notice that either "ON" or "OFF" appears in large letters on the screen. You may change the programming by pressing

 for the heater to be "ON" or  for the heater to be "OFF" during the filter cycle indicated in the upper right corner of the screen.

To proceed through the remainder of the filter programming sequence, PRESS



and adjust in the manner described above.

CHOOSING THE "STANDARD" OR "ECONOMY" MODE

Your Sundance Sentry™ 700 Series controls have been designed to give you maximum convenience, as well as economy of operation. By selecting the appropriate operating mode, you can ensure that your spa will be ready to use anytime with the lowest possible energy consumption.

Standard Mode

In the "standard" mode, the spa water temperature will always be held at the set temperature. The low speed pump and the heater will turn on as needed to maintain the spa water temperature within one degree of the temperature you have set with the temperature control. When the desired temperature has been achieved, both the pump and heater will turn off.

In addition, when in the "standard" mode, the filter cycles will operate the low speed pump as programmed to give your spa the required filtration.

In summary, we suggest you use the "standard" mode in the following situations:

1. Upon initial fill-up to bring the water up to the desired temperature.
2. Anytime you desire a temperature rise prior to the next "heater on" filter cycle.
3. Anytime you desire temperature maintenance while using the (unless it is during a "heater on" filter cycle).

At all other times, it is advisable to use the "economy" mode.

Economy Mode

In the "economy" mode, your spa will turn on automatically *only* during the filter cycles. During these cycles, the heater will operate *only* if programmed to be on during a particular filter cycle *and* the actual water temperature is lower than the set desired temperature.

Because of the exceptionally high heat retention capabilities of your Sundance Spa, you will find that the "economy" mode is more than adequate for normal day-to-day operation.

PANEL LOCK

To help prevent unauthorized use of your spa, the Sentry 700 Series incorporates a unique panel locking system which disables the controls on the panel.

To Lock The Panel

PRESS		DISPLAY WILL READ	
PRESS		DISPLAY WILL READ	
PRESS		DISPLAY WILL READ	

NOTE: These must be pressed *within three seconds* or the spa will return to normal functioning.

Once the panel is locked, the display will show the spa temperature along with the lock symbol. All the pads are now deactivated except the program pad which is used to initiate the unlock sequence.

IMPORTANT: When the panel lock is engaged, all automatic spa functions will operate normally. Only the functions typically operated when the spa is in use are affected.

To Unlock The Panel

PRESS the following pads within a three-second time period:

The lock symbol will disappear. All pads are now active.

TEMPERATURE SETTING LOCK

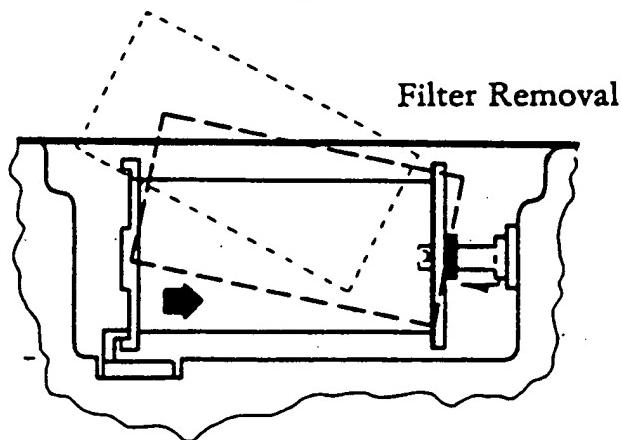
To electronically lock the temperature setting, first enter the "set temperature" mode by pressing either the "warm" or "cool" sensor. Then, within three seconds, press the three sensors described under "Panel Lock" above. This will prevent the temperature setting from being changed by unauthorized persons but all other sensors will remain active.

To unlock the temperature setting so that it can be adjusted, simply follow the instructions above under "To Unlock the Panel."

Spa Maintenance

Proper and regular maintenance of your spa will help it retain its beauty and performance. Your authorized Sundance Dealer can supply you with all the information and accessory products you will need to accomplish this.

ILL. No. 6
Cartridge Filter



CLEANING THE FILTER

Each Sentry™ 700 Series controlled Sundance Spa is equipped with a cartridge filter. It is located in the skimmer/filter well (See ILL. 5, ITEM 2) near the top edge of the spa and is uniquely designed for easy removal and cleaning. Filtering is accomplished by causing water to flow through the polyester mesh of the filter, and as water flows through the filter, suspended particles become trapped on its surface.

It is necessary to remove the filter and clean the cartridge surface, generally every four to eight weeks, depending on usage and water quality. This is done by loosening the large retainer nut on the pipe at the base of the filter and rotating the cartridge gently. When the cartridge pops loose (up), slide the cartridge off the filter pipe. Cleaning is accomplished by washing all the entrapped dirt from the filter with a garden hose with a high pressure nozzle.

NOTE: When replacing the filter cartridge, rotate the retainer nut around the pipe until it touches the base of the cartridge. DO NOT OVERTIGHTEN! This retainer nut is intended only to hold the filter in place and is not intended to act as a positive seal.

Occasionally, the cartridge will need a better cleaning to remove oils and grime from its surface. For this we suggest you remove the cartridge, clean with a high-pressure nozzle, then place the cartridge in a Sundance filter cleaning bag, soaking the cartridge three to six hours or overnight in a solution of specially formulated cartridge filter cleaner, available from your Sundance Dealer.

The average life expectancy of a Sundance filter cartridge is approximately two years with proper care and water quality maintenance. A replacement cartridge may be purchased from your Sundance Dealer.

DRAINING & REFILLING

CAUTION: There are certain precautions to keep in mind when draining your spa. If it is extremely cold, and the spa is outdoors, freezing could occur in the lines or the equipment. On the other hand, if it is hot outdoors, do not leave the spa surface exposed to direct sunlight for long periods.

One method of draining your spa is by natural siphon. First, slide open one of the equipment doors to discontinue power to the spa so that none of the automatic functions will come on during this process. Second, place the outlet end of an ordinary garden hose in the bottom of the spa. Third, connect the other end to an outside faucet and turn on the faucet to fill the hose with water. Next, shut off the faucet, disconnect the hose and place this end of the hose in the area to which you want the water to drain, making sure it is lower than the bottom of the spa. Repeat this process with as many hoses as you like in order to speed the draining of the spa.

There is also a main drain hose you can use within the equipment cabinet (See ILL. 1.1, ITEM 9). Raise the drain hose above water level and remove the cap to connect a garden hose. Don't forget to replace the cap after draining.

To drain the filter bay, open the filter bay drain faucet (See ILL. 1.1, ITEM 8) and allow water to run out. You may wish to catch the approximately one gallon of water in a pail for disposal elsewhere.

After refilling, follow the steps listed under "Start Up Instructions."

CLEANING THE SPA SURFACE

To preserve the sheen of your spa's surface, it is crucial that you avoid using abrasive cleansers which have adverse chemical effect on the surface. If you are not certain as to the suitability of a particular cleanser, consult your authorized Sundance Dealer.

Regardless of the cleanser used, use extreme care to assure that no soap residue is left on the surface. This could cause severe sudsing when the spa is refilled. Use water to clean the control panel. Do not use any soaps, chemicals, or solvents.

MAINTAINING THE WOOD SKIRT

With time and exposure to the elements, the wood on your spa will tend to lose its new appearance. Protecting or reviving the wood surfaces is a fairly simple process.

Light sanding with fine-grit sandpaper will help smooth any roughness, and regular applications of a penetrating wood preservative will enhance and protect the richness of the wood.

NOTE: Do not apply varnish, shellac or other surface sealants to the wood.

These tend to react with the chemicals in the wood and the UV rays of the sun, causing yellowing, flaking and peeling.

MAINTAINING THE COVER

Using the optional Sundance insulating spa cover anytime the spa is not in use will significantly reduce your operating costs, heat-up time and maintenance requirements. To prolong the life of the cover, handle it with care and clean it regularly using mild soap and water. Periodic treatments with a special conditioner developed for Sundance Spa covers, will help protect against deterioration caused by U.V. rays from the sun. Never allow anyone to stand or sit on the cover, and avoid dragging it across rough surfaces

WINTERIZING

Your Sundance Spa is designed to automatically protect itself against freezing when operating properly. During periods of severe freezing temperatures, you should check periodically to be certain that the electrical supply to the spa has not been interrupted.

If you do not intend to use your spa, or if there is a prolonged power outage, during periods of severe freezing temperatures, it is important that all water be removed from the spa and equipment to protect against damage from freezing.

For expert winterization of your spa, contact your authorized Sundance Dealer. If this is not practical in your situation, damage can be minimized or avoided by taking the following steps: Follow the directions on page 23 for draining the spa. Then, as the water level drops below the seats, turn on the air blower momentarily to evacuate the injector lines. Open the filter compartment drain to allow all the water to run out of it. Finally, when the entire spa is drained, remove the black bolt-type plug located at the bottom of the left side of the pump to release the last bit of water.

NOTE: Approximately one quart of water will escape. Be prepared with a shallow pan to catch this water so as not to allow it to remain in the equipment bay.

Cover the spa so that no casual moisture can enter the spa.

Consult your Authorized Sundance Dealer if you have any questions regarding winter use or winterizing.

Water Quality Maintenance

Maintaining the quality of the water within specified limits will serve to enhance your enjoyment and prolong the life of the spa's equipment. It is a fairly simple task, but it requires regular attention because the water chemistry involved is a balance of several factors. There is no simple formula, and there is no avoiding it. A careless attitude in regard to water maintenance will result in poor conditions for soaking and even damage to your spa investment.

For specific guidance on maintaining water quality, consult your Authorized Sundance Dealer who can recommend appropriate chemical products for sanitizing and maintaining your spa.

CAUTION: Never store spa chemicals inside the spa's equipment bay.

pH CONTROL

pH is a measure of relative acidity or alkalinity of water and is measured on a scale of 0 to 14. The midpoint of 7 is said to be neutral, above which is alkaline and below which is acid. In spa water, IT IS VERY IMPORTANT TO MAINTAIN a slightly alkaline condition of 7.2 to 7.8. Problems become proportionately severe when this range is exceeded or diminished. A low pH will be corrosive to metals in the spa equipment. A high pH will cause minerals to deposit on the interior surfaces (scaling). In addition, the ability of the sanitation agents to keep the spa clean is severely affected as the pH moves beyond the ideal range. That is why almost all spa water test kits contain a measure for pH as well as sanitizer.

SANITIZING

To destroy bacteria and organic compounds in the spa water, a sanitizer must be used regularly. Your Sundance Spa is equipped with The Brominator™, a special compartment built into the floating skimmer gate to hold bromine tablets. By regulating the number of bromine tablets in The Brominator, and the length of the filtration cycles, you can control the amount of bromine which is actively working in your spa water. A bromine residual of 2 to 3 ppm is generally considered desirable.

A two-part bromine system or granular chlorine (dichlor) are also acceptable sanitizers.

IMPORTANT: Do not use chlorine tablets (Trichlor) in your spa.

OPTIONAL OZONE WATER PURIFICATION SYSTEM

If you have elected to have your spa equipped with the optional Sunzone ozone water purification system, you will find that your water stays fresh and clear with significantly less bromine usage. You will also probably be able to go longer between complete spa drainings.

Read and follow the instructions included with your Sunzone ozone water purification system to determine how to adjust your bromine usage and filter cycles.

OTHER ADDITIVES

Many other additives are available for your spa. Some are necessary to compensate for out-of-balance water, some aid in cosmetic water treatment and others simply make the water feel or smell better.

Your Authorized Sundance Dealer can advise you on the use of these additives.

Troubleshooting

DISPLAY MESSAGES

There are a number of unique functions designed into your Sundance Spa to protect it from damage and/or to aid in trouble-shooting. Following is a listing of all the possible messages along with their meaning:

MESSAGE	MEANING
IL OC	INTERLOCK (Spa is deactivated). The spa's equipment doors are not properly closed. Doors must be closed for <i>any</i> of the spa's functions to operate.
Pd	BATTERY BACK-UP Power has been cut off to the spa, and it is using 15-minute battery back-up to preserve its settings. The control panel will be disabled until power is returned to the spa.
OH	OVERHEAT PROTECTION (Spa is deactivated) If a malfunction occurs and spa water reaches 112° F., the system will completely shut down. In such a condition, DO NOT ENTER THE WATER. Turn off all power to the spa and contact your dealer or service organization.

NOTE: if you set the filter cycle to operate the low speed pump for extended periods of time, overheating may occur. If this happens, remove the spa cover and allow the water to cool to below 110° F. Touch the mode pad



to reset the system. If the water is still hotter than the set temperature, touch the blower pad to cool the spa.

MESSAGE**MEANING****FLO****FLOW SWITCH (Heater is deactivated)**

Proper flow of water is inhibited or a pressure switch has malfunctioned. Check flow valves in equipment bay. Check for proper water level. Check for clogged filter. Contact your dealer or service organization.

COOL**TEMPERATURE SET BACK**

If spa water is more than 20° F., cooler than the temperature set point, the heater will automatically activate to provide freeze protection. This is a normal spa function; no corrective action is necessary.

ICE**FREEZE PROTECTION**

If a freeze condition is detected, low-speed pump is automatically activated. This is also a normal spa function; no corrective action is necessary.

Sn 1**OPEN SENSOR (Spa is deactivated)**

The high-limit temperature sensor is non-functional. This must be repaired only by a dealer or qualified service organization.

Sn 3**OPEN SENSOR (Spa is deactivated)**

The main sensor is non-functional. This also must be repaired by a dealer or service organization.

TROUBLESHOOTING PROCEDURES

Your Sundance Spa is the result of many years of careful engineering and a quality first commitment of Sundance personnel. We find that many "problems" are the result of either a misunderstanding of how the spa operates or improper installation.

In the unlikely event your spa is not working the way you believe it should, please first review all the installation and operating instructions in this manual and check the message on the panel display; second, if you are still not satisfied it is working properly, please follow the appropriate troubleshooting instructions.

PROBLEM	PROCEDURE
Spa does not operate.	<p>Check control panel display (ILL No.4.1)</p> <p>If it is ON go to 1.</p> <p>If it is OFF go to 2.</p> <ol style="list-style-type: none">1. Make sure equipment door is closed.2. Check for proper power connection.3. Check power at circuit breaker.4. Check service voltage for full 240V or full 120V.5. If spa still won't run, call your serviceman.
High speed pump (jets) does not operate.	<p>Check 1 through 4.</p> <p>Check jet indicator symbol on panel.</p> <p>If OFF go to 2.</p> <p>IF ON go to 1.</p> <ol style="list-style-type: none">6. Depress jet sensor.7. Check flow valves in equipment bay.
Low Speed Pump (jets) does not operate.	Check 1 through 7.
Poor jet action.	<ol style="list-style-type: none">8. Check jet is in High Speed.9. Rotate whirlpool knob.10. Check for adequate water level.11. Check for dirty filter.12. Open air controls.
No or low heat.	<p>Check 1 through 7.</p> <ol style="list-style-type: none">13. Check operating mode (is it in "Economy" or "Standard"). Spa will not heat in "Economy" unless the filter cycle is engaged.14. Check that the pump is ON.15. Set temperature higher than the actual water temperature.

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Your authorized Sundance Dealer is a trained service repair center. Should checking the above steps fail to correct the problem, please call your dealer so that he may arrange service.

Your Sundance Dealer's phone number: _____

Sundance builds the best spas in the industry. Nonetheless, we are always striving to improve the quality and features of our products. Your input as a Sundance Spa owner is a cherished part of his process. If you have any comments or suggestions, or if you wish to be informed on any new products for your spa, please write to us.

CONGRATULATIONS on your good taste and welcome to the happiest and most relaxed family in the world!

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The Ultimate Spa Controller

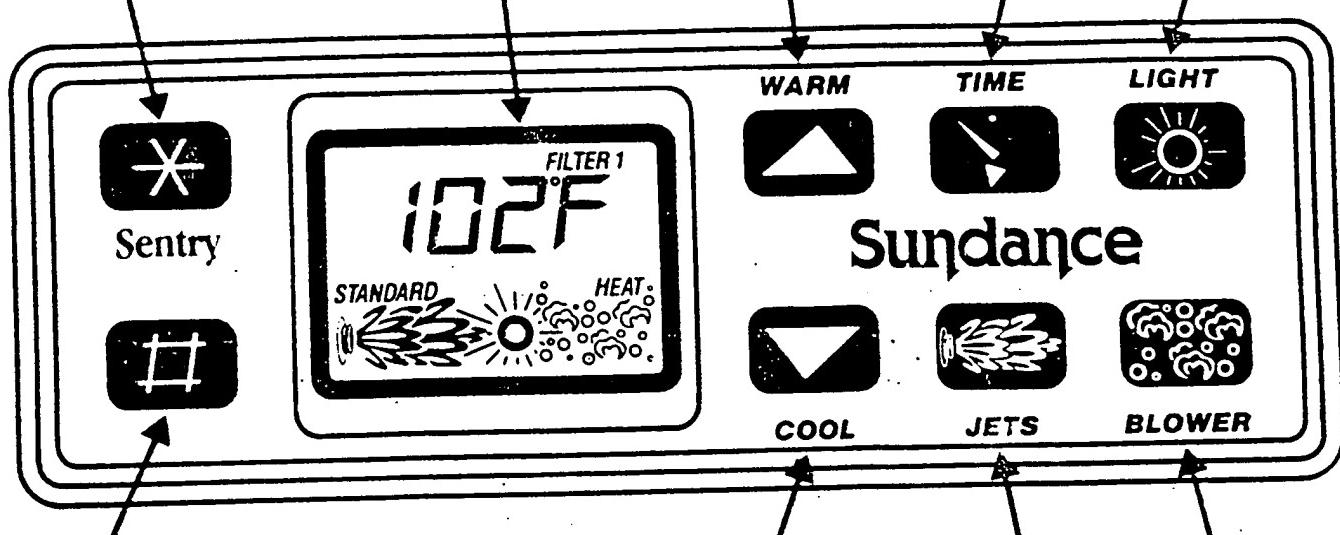
Program
For initiating time setting, filter cycle and panel lock.

Liquid Crystal Display
The "Information Center" of your spa.

Warm (up)
Sets the temperature of your spa warmer and sets the clock forward.

Time
Shows the time of day.

Light
Turns the light on and off.



Mode
Switches your spa from economy to standard mode and visa-versa.

Cool (Down)
Sets the temperature of your spa cooler and sets the clock back.

Jets
Controls the two-speed pump.

Blower
Turns the air blower on or off.



SEPTEMBER 1982

ISSUE NO. 5

FORECAST

We would like to thank all of you who had a hand in making this season a successful one. We appreciate the support and loyalty of our dealers and OEM's, and let us just remind you that it's not over yet! The season opened early this year and really took off. Although sporadic, it was a better season than we had ever anticipated with the economy being so undeterminable. If this is any indication of what next year will be, you can bet that we will be ready for it.

Our computer pack received outstanding reception and our dealers, as well as their customers, seemed to love it. We have had an overwhelming amount of calls from customers who have seen our product and wanted to know where they could purchase it. Of course, we referred them to you.

In the next year, we will be coming out with many new products. Among them are new controls as a retrofit for any pack. Our new light and our new blower are only a start as to the many new items on the line. We are looking at many various heaters from a variety of manufacturers as well as countries. We are looking for the ultimate in spa water heaters for the portable market and will continue searching in order to serve you better.

Next season looks like it should be very good. I think this season will wash out a lot of people in the business and we should be able to start with a sounder base. Yes, there will be fewer of us, but those who remain will make the industry stronger.

RETURNING GOODS

To expedite the handling of warranty and non-warranty parts being returned, we have instigated tight controls. Before you return anything to us, be sure to call Peggy Lacy, Service Manager, for a Returned Goods Authorization (RGA) Number. When shipping parts, back, clearly mark outside of the box with RGA Number for identification. No shipments will be accepted without this.

We were having a problem of dealers just sending back a part and the receiving department didn't know whether they should receive it or not. We hope our RGA procedures alleviate the problem. We just want to be able to identify what the problem is so that we can direct it to the proper person.

WHAT'S NEW

Portable spas will continue to be the trend of the present and future. Continually trying to find ways of upgrading the system is our major goal. Well, we have seen the light!! How about a portable spa light that doesn't require a niche? No, not a fiber optic, but a low voltage, high intensity light that slides right into the same size hole as your thru-wall fitting. This makes installation a ten minute job; low voltage makes it safe and the intensity is twice that of any portable spa light on the market today! You are really going to love it and your customer will love you.

Did you say blower? We have that too! We have just developed our own two stage blower which takes away all the worries of tub

depth as well as length of the air run. This little beauty is made of polished aluminum to resist the elements of weather and prevent melt downs. We now sell the Spa-Trol Air Blower to many OEM's as well as our dealers. We're not the only ones that consider the air blower to be the quietest on the market. It comes in all sizes from 1HP to 2HP to suite your every need.

We at Spa-Trol are happy to announce that as of August we cut our lead time from what was 5 weeks to what is now 5-10 days. We added more production lines as well as production engineers. Unfortunately, when the season hit this year, it hit hard and early. No one, including ourselves, anticipated the volume that was to come. As you know, in the mid-winter we have the unfortunate task of looking into our crystal ball and deciding in what volume we need to commit ourselves. Well, needless to say - by early June we were about 600 units back ordered and our vendor gave us 6 weeks to catch up. But now we are all caught up and going strong!

Finishing off with a bang, we would like to introduce the newest members of the Spa-Trol family:

110V	1.5 AMP	525.00
220V	6 KW	625.00
220V	11 KW	675.00
110V	Gas Condo	725.00
220V	Super Gas	875.00

(Time clock is optional)

These are all air switch controlled with the same quality you would expect from Spa-Trol. We have started manufacturing these low cost gems for the exclusive distribution by Spa-Supply. Who said the economy would hinder our industry?

AS you wanted
no air
no tubes
no bulbs.

A real controller,
electronic,
user-friendly,
and very
reliable.

As you expected.



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POOL & SPA news

Volume 25, Number 21

Serving the Industry for 25 Years

November 3, 1986

SPI to host biggest exhibition ever



Although the show is not yet officially featured in this year's fall industry calendar, the New Orleans convention, which is participating with 100 exhibitors, will occupy an additional 100,000 square feet.

With more than 100,000 square feet added to the show, said Industry Communications Director of Communication for the NSPI, it's difficult to get excited about the association's home base of Alexandria, Va., being host city for the biggest show in the pool-and-spa industry's history.

The first 100,000 projected 14,000 participants from various sectors of the pool-and-spa and related industries will start streaming into the nation's capital as early as Nov. 16, the Sunday before the convention.

Convention coverage starts on page 25.

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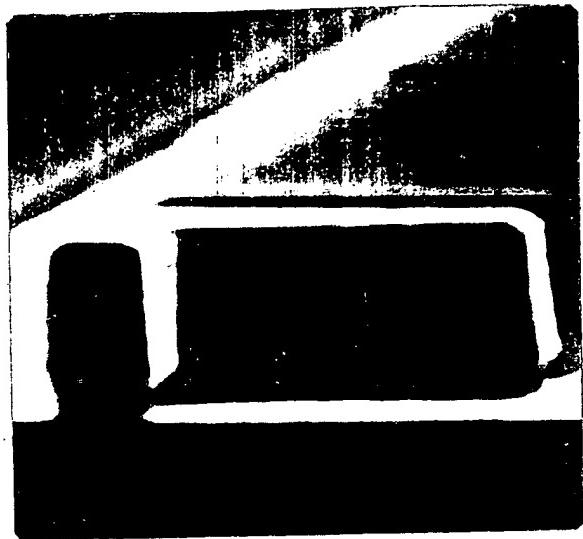


FIG. 2A

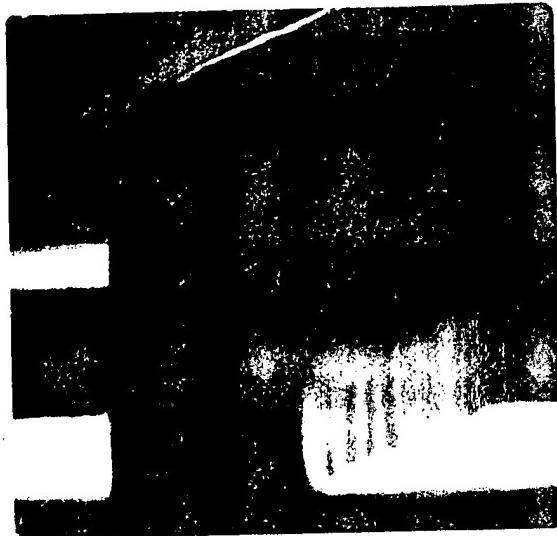


FIG. 2B

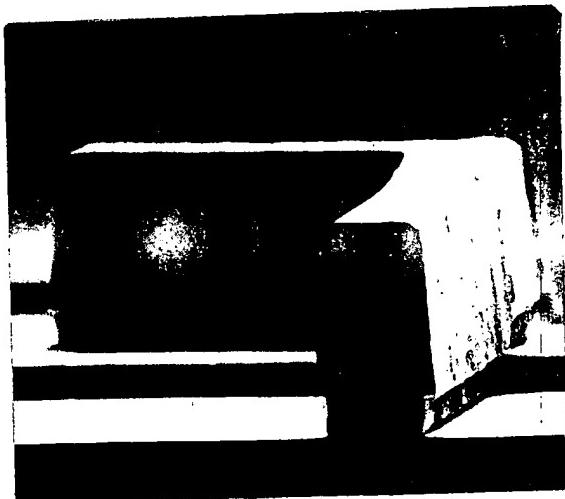


FIG. 4

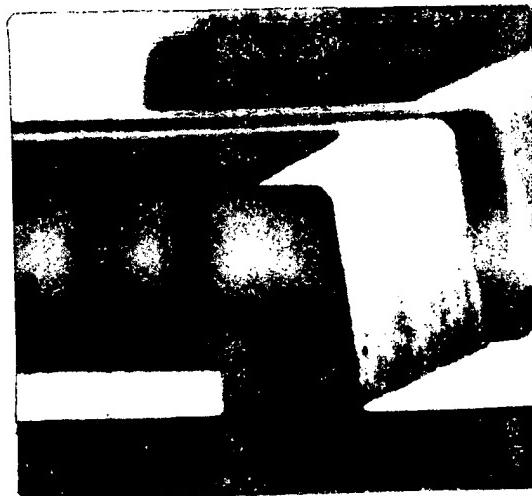


FIG. 5

These
Papers
Go
Other with FILE

marked as Plaintiff's Exhibit 113.

(23) (Plaintiff's Exhibit 113 was marked
(24) for identification by the Deposition
(25) Officer and is retained by counsel.)

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(1) Q BY MR. HEIM: When we were going through (2) the software that was produced on December 6th, we saw (3) this version of the software and – and it looks like (4) it's the 700 series version.

(5) Do you see that?

(6) MR. PAINE: Would you clarify that. I didn't (7) follow that, Mike.

(8) MR. HEIM: Sure.

(9) Q We got some soft- – we got a software (10) code produced to us on December 6th –

(11) (Counsel talking simultaneously.)

(12) MR. PAINE: I'll give you the actual printouts, (13) yeah.

(14) MR. HEIM: Right.

(15) MR. PAINE: Okay.

(16) Q BY MR. HEIM: And one of the – this is (17) one – this is the first page of one of those different (18) versions, and it looks like it's a 700-3 PMP version.

(19) Do you see that?

(20) A Yes.

(21) Q Is this for the 700 series?

(22) A No.

(23) Q Do you know what this is for?

(24) A I – I believe this is the version that (25) we – it's a modified version of 800.

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(1) Q Okay.

(2) A It's a 3 – PMP means "three pump."

(3) Q Okay.

(4) A Right.

(5) Q Do you know why it's called 700?

(6) A No, I don't know why it was called 700. (7) Maybe it was a typo, or maybe it was just we called it (8) 700. I think we developed this for Spa Builders maybe.

(9) Q Okay. Spa Builders sells – sells a (10) 700 –

(11) A Right.

(12) Q – series; is that right?

(13) A No, it didn't sell 700. We modified – (14) they wanted the version that they had, three pumps, (15) instead of two pumps on the blower. And that's what we (16) called it. I don't know – that's why they called them (17) 700. I – I – it's not the 7 – same 700 that Balboa (18) has. It's different.

(19) Q Yes. I understand that, but –

(20) A Right.

(21) Q – do you know the model numbers of the (22) Spa Builders control systems?

(23) A No, I don't.

(24) Q This software was produced for Spa (25) Builders you believe?

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(1) A I believe so. I don't know if they (2) manufactured any, but I think it was produced for them.

(3) Q Have you done any other work for Spa (4) Builders?

(5) A Yeah, yeah.

(6) Q What have you done?

(7) A You mean as far as the softwares?

(8) Q Software or hardware.

(9) A No. Spa Builders manufacture our (10) controls. They are – they are a assembly house (11) basically.

(12) Q Okay.

(13) A So I worked with them as far as getting (14) the – the control, the assembly – design assembly on a (15) constant basis.

(16) Q They assemble the 800?

(17) A 800, 600.

(18) Q Do you also work with them on the 700?

(19) A No.

(20) Q Who is their engineer for the 700?

(21) A On this one? I think it's Steve Macey was (22) helping them to do this.

(23) Q Do you know if Steve Macey is still (24) helping them?

(25) A No.

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(1) Q Who – do you know who does their software (2) revisions if they need them?

(3) A As I said, they manufacture. I don't even (4) know if they manufacture this. They don't make any (5) microprocessor controls.

(6) Q Is the 700 – this was written for a (7) microprocessor control, wasn't it?

(8) A That's correct. That was on the same (9) circuit board, the 800 board, the – what we had, right.

(10) Q Does – in the 800, does Sundance mark its (11) circuit boards with its name on it?

(12) A Yes, I'm sure it does. I think Sundance (13) name is on the circuit board, yes.

(14) Q Okay. If – is that same 800 circuit (15) board – was it ever used in the 700?

(16) A Was it ever used? That's exactly the same (17) board that was used, if it was used, in production. But (18) I don't know if they went to production with that or (19) not.

(20) But the software, as you can see version (21) 1.0, was developed for that.

(22) Q Yes. This is the first version; is that (23) right?

(24) A This is the first version of three pumps (25) that we developed for – for Spa Builders.

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(1) Q Did – did you develop some other (2) versions?

(3) A No.

(4) Q Did you develop some that were not (5) three-pump systems?

(6) A Maybe they had the two pumps, but as I (7) said, I wasn't involved in that.

(8) (Mr. Curfiss and Mr. Clark (9) enter proceedings.)

(10) Q BY MR. HEIM: I'm going to hand you a (11) document previously marked as Exhibit 97.

(12) A Okay.

(13) MR. HEIM: If you need a copy, I've got a bunch (14) of them over here.

(15) MR. PAINE: Yeah, okay.

(16) Q BY MR. HEIM: Exhibit 97 says: (17) "New Century 800 controls (18) exclusive," (19) And then it says: (20) "Same features as 700 series plus."

(21) A Right.

(22) Q Do you see that?

(23) A Right.

(24) Q I'd like to just run down these. We – we (25) asked Galvin Bartlett about some of these and he wasn't

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(1) clear exactly –

(2) A Can I mention –

(3) Q Yes.

(4) A – this 700 here and this 700 here are two (5) different 700s (indicating).

(6) Q Okay.

(7) A Yes, this 700 you have here, it talks (8) about the 700 – Balboa 700.

(9) Q Okay. So Exhibit 97 is referring to the (10) Balboa 700 series?

(11) A That's correct.

(12) Q Okay. The first item listed on Exhibit 97 (13) is two-speed air blower?

(14) A Right.

(15) Q I think we already talked about – about (16) this feature. This is implemented through the use of (17) an – an Opto Couple Triac Driver (phonetic); is that (18) right?

(19) A Opto Isolator Triac Driver, yes.

(20) Q Okay. And that's what makes that (21) two-speed –

(22) THE DEPOSITION OFFICER: I'm sorry. Can you (23) repeat your answer?

(24) THE DEPONENT: Opto Isolator Triac Driver.

(25) MR. HEIM: Opto is spelled O-p-t-o.

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(1) Q And that's what makes possible the (2) two-speed capabilities; is that right?

(3) A Let me - let me think about this.

(4) Q Sure.

(5) A No, this one - I'm sorry. This one on (6) this model - we don't have the Opto Isolator Triac (7) Driver - its relays.

(8) Q On the 800 system?

(9) A On the 800 system.

(10) Q It now has - didn't you say it now has (11) in -

(12) A It now has, in 1993, has the Opto (13) Isolator.

(14) Q Why did they change from the relay system (15) to the - to the Opto Isolator system?

(16) A Well, we wanted to control the - we (17) wanted to have the feature of two speeds. The way we (18) were doing it with the relays, we were also going through (19) a heating element and using as a voltage drop, and that (20) way we were getting the - the second speed to come at a (21) lower RPM.

(22) As you can see, it says in the lower speed (23) it has "heated" because it was going through that (24) element, and - and after that, we didn't want to have (25) that. We just - we wanted to use the blower to be able

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(1) to control it, and that's why we changed it in 1993.

(2) Q The second feature is dimmable light.

(3) A Right.

(4) Q That - that does use the Opto Isolator?

(5) A That does use the Opto Isolator, yes.

(6) Q How do you - what's the cost of the Opto (7) Isolator as compared to relay circuits?

(8) A I don't know. I think it was little bit (9) more expensive than relays; depends what amperage you're (10) talking about.

(11) Q The "ozone on indicator light," what is (12) that?

(13) A It's just an - it's an LED light that it (14) will light up on the back of the ozone O3 icon, which if (15) there is an ozone unit and if it's operating, then it (16) will sense that current going through and it will turn (17) the lights on.

(18) Q So this feature is just the addition of an (19) LED?

(20) A Yes. It's an addition of LED, and so it (21) kind of sends a - a signal back through the top side if (22) the ozone is on, which we didn't have at the 700.

(23) Q Okay. The - the next item is "ozone on (24) only during filter cycle"?

(25) A Right.

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(1) Q What - what did the 700 series do?

(2) A I think on 700, the ozone maybe was tied (3) to low-speed pump, and it was on anytime that lower speed (4) pump was on: During the filter cycle or during the heat (5) cycle. But on this one, it was only - it only turned on (6) during the filter cycle.

(7) Q Is that implemented through software?

(8) A Yes.

(9) Q The next item is "time delay pump (10) switching." Again, that's implemented during - (11) implemented through software?

(12) A That's correct.

(13) Q And - and that just means that there's (14) going to be a delay before the pump turns on?

(15) A Yeah. You have two-speed pump. You are (16) switching from low to high. It would have split (17) seconds. I don't know how many minutes - seconds it was (18) delayed so it wouldn't switch too fast.

(19) Q Do you know why they have that?

(20) A I'm not sure why they had them. It was a (21) feature that they used. We don't have them now.

(22) Q The 800 series doesn't have time delay (23) pump switching?

(24) A The new 8- 800 new '93 we modified it. (25) We don't have that.

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(1) Q The "permanent time clock chip," what is (2) that?

(3) A A permanent time clock chip? Oh, time - (4) oh, permanent time clock. It's the chip that it has a (5) built-in battery in it. It has a ten years backup.

(6) Q The clock chip has ten-year backup?

(7) A Yes.

(8) Q Is that different than the next item, (9) the "self-powered clock chip"?

(10) A Self-powered clock chip - no. Probably (11) it's the same chip that they're talking about. So it (12) keeps the - because if it has a battery, there's a power (13) inside it. It's a static RAM also.

(14) Q The next item says "pH and Orp," O-r-p, (15) "readout capabilities."

(16) A Right.

(17) Q Did the 700 not have these - that (18) capability?

(19) A The 700 had the pH capability, and I don't (20) think it was ever used. We made some prototypes, but no, (21) I don't think it was ever used.

(22) Q Okay. What controllers did Balboa have (23) when you first started going - when you first went to (24) work for them?

(25) A 19 - let me see. I remember 604 was in

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(1) production.

(2) Q Any other ones?

(3) A 604, and that was first I went there. And (4) then shortly after, in '85, they renamed it to a 605.

(5) Q Were there any hardware changes between (6) the 604 and the 605?

(7) A There were some changes. I'm not sure (8) exactly. Maybe some additional features, but not (9) really - I don't remember.

(10) Q Okay. And when did the 605 come out? You (11) said sometime in '85 or '86?

(12) A 605 was '85.

(13) Q What was the next controller that Balboa (14) came out with?

(15) A At the same time we made 624, which was (16) the 240 version of the 605, and then 700 series.

(17) Q When was the - when did you come up - (18) when did Balboa come out with the 624?

(19) A I believe it was 1995 to the same time.

(20) Q When did the 700 series come out?

(21) A Production you mean? We went back - (22) okay, or when we actually started developing that?

(23) Q Well, let's talk about both. When did (24) they start developing it?

(25) A Probably August or '85 when I started.

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(1) That was the reason I started there.

(2) Q Was to work on that project?

(3) A No. I started to work on something else. (4) And the engineer who were there was getting in charge of (5) developing the microprocessor 700.

(6) Q Who was that engineer?

(7) A Cindy Otto (phonetic).

(8) Q When did they actually come out in (9) production with the 700 series?

(10) A I think in '87 we had 50 units, we built (11) 50 prototypes, and we gave them to the market - I guess (12) we gave them to Sundance at that time and for the dealers (13) and for Sundance employees to put them in the spa and

use (14) them.
 (15) Q You think that was sometime '87?
 (16) A Yes.
 (17) Q Are you - are you pretty sure about that (18) date?
 (19) A I am very sure about that date.
 (20) Q Okay. Do you know what - what month of (21) the year that was?
 (22) A No, I don't remember.
 (23) Q Do you - do you know anything about a 200 (24) system?
 (25) A 200 system? Yes.

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(1) Q What was the 200 system?
 (2) A 200 system was a down-sized version of a (3) 605 system, and it had less capabilities, didn't have (4) the - I guess the blower. It was really designed to (5) work with the little top.
 (6) Q Do you know when they - when Balboa came (7) out with the 200 series?
 (8) A Maybe - I'm not exactly sure - '88, '87, (9) '89 somewhere in that area.
 (10) Q Okay.
 (11) A And I don't think we made many of them (12) either so ...
 (13) Q Let's talk about the 600 series. Those (14) were all - were those all electronic controllers?
 (15) A Yes.
 (16) Q They weren't electromechanical?
 (17) A No.
 (18) Q Okay. Did they have programmable logic?
 (19) A Programmable logic? No.
 (20) Q So they didn't have the PAL-type device (21) that we just saw in the Sundance 600 series?
 (22) A No.
 (23) Q They didn't have that.
 (24) The 700 series was a microprocessor (25) device?

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(1) A Yes.
 (2) Q Okay. Were you involved in shipping the (3) first hund- - the first 700 units out?
 (4) A Oh, yeah.
 (5) MR. HEIM: Let's go ahead and mark this as (6) Exhibit Number ...
 (7) THE DEPOSITION OFFICER: 114.
 (8) MR. HEIM: 114.
 (9) (Plaintiff's Exhibit 114 was marked (10) for identification by the Deposition (11) Officer and is retained by counsel.)
 (12) Q BY MR. HEIM: Exhibit 114 is a - about (13) four or five pages that we received from Sundance in this (14) lawsuit.
 (15) A Uh-huh.
 (16) Q And the third page of this document -

(17) A Okay.
 (18) Q - has on the top, it's a delivery receipt (19) from Balboa Instruments. Do you see that?
 (20) A Yeah.
 (21) Q And the date is March 31st, 1988.
 (22) A Right.
 (23) Q Down there it has "system 701 complete"?
 (24) A Yeah.
 (25) Q And then down below that it has "first

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(1) Article 701 system."
 (2) A Okay.
 (3) Q That's why I was asking you if you were (4) sure about the '87 being the date because - does this (5) change your mind? I guess is the question.
 (6) A No.
 (7) Q Okay. Do you know what this referred to?
 (8) A Well, that's seems like a 701/724 system. (9) I think. Seems like there were a couple of 701 and 724 (10) we sent to Sundance to their engineering department.
 (11) Q Do you know why Balboa would have called (12) these the "first article systems"?
 (13) A I'm not sure - well, I mean, maybe there (14) are - let me think. Maybe -
 (15) MR. PAIN: Don't guess. Don't guess if you (16) don't know.
 (17) THE DEPONENT: Well, I can't answer.
 (18) Q BY MR. HEIM: Okay. Do - do you know the (19) person who signed this document? I guess that actually (20) says "received" so that would have been a -
 (21) A That was at Sundance.
 (22) Q - a Sundance person.
 (23) Do you recognize that signature?
 (24) A No.
 (25) Q Do you know when Sundance first began

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(1) selling the 700 system?
 (2) A I thought it was '88.
 (3) Q Okay. Did anybody other than Sundance (4) sell the 700 system?
 (5) A I don't know. I know we've made some (6) controls for Klor (phonetic) Corporation in '88 or '89 at (7) that time, but I don't know what unit it was. Either it (8) was a 600 unit - I mean 624 or 700. And I can't - I (9) don't remember that.
 (10) Q Why - you said you made about 50 units of (11) the first

prototypes of the 700 series?
 (12) A Right.
 (13) Q Do you remember who all you shipped those (14) out to?
 (15) A Well, we gave all of them - all of them (16) to the - I mean, we have - we gave all to Sundance, and (17) we had few of them in the spas that we have at Balboa. (18) And I don't know where and when they went, no. I think (19) few of the employees at Sundance had some and -
 (20) Q Some of the original 700?
 (21) A Exactly.
 (22) Q Do you know which employees would have (23) those?
 (24) A No, not right now, no, I don't.
 (25) Q Did - did Balboa ship - send out

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(1) shipping documents with those prototypes?
 (2) A I'm sure they did. Yeah, I wasn't working (3) in the shipping department, so I don't know that.
 (4) Q Were changes made to the 700 system after (5) those first 50 prototype units were shipped out?
 (6) A As far as the - the - what part of the (7) system?
 (8) Q Hardware or software.
 (9) A I - I - I don't remember.
 (10) Q You weren't intimately involved with that (11) project?
 (12) A I was involved in testing it, and - but (13) I - I'm sure there were some feedbacks - this was (14) prototypes - some feedback from marketing department, (15) Sundance marketing department, back to us, and maybe they (16) wanted different features or add things, or - and they (17) need some features, and, you know, but ...
 (18) Q Do you know what revision was the actual (19) pro- - production version?
 (20) A No, I think that we - we just called them (21) 700 series.
 (22) Q Let me hand you a document marked as (23) Exhibit 115. (24) // (25) //

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(1) (Plaintiff's Exhibit 115 was marked (2) for identification by the Deposition (3) Officer and is retained by counsel.)
 (4) Q BY MR. HEIM: Do you recall seeing this (5) exhibit before?
 (6) A Sure.
 (7) Q In the bottom right-hand corner it has a (8) date of October 19th, 1988, and a revision date of (9) December 8, '88. It says "700 Schematic Revision 78-B"?
 (10) A Yes.
 (11) Q And this is the only Balboa drawing that (12) I've seen.

(13) A Yeah.
 (14) Q Do you know if this was the – the actual (15) production version of the 700 series?

(16) A I think it was. I'm sure maybe after that (17) there were other revisions, but this was a production (18) revision.

(19) Q Okay. Does that mean that the actual (20) production could not have occurred until October 19th, (21) 1988?

(22) A No. Actually, it may have happened a lot (23) sooner than that. This was another revision of it. As (24) you can see, it says "Rev. 8-B." I'm sure there was a (25) Rev. 8 – 8-A or even prior to that.

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(1) Q What – and that was really my question.

(2) Do you know which version was the – the (3) commercial version that was sold?

(4) A I – I can't – I don't remember right (5) now, no.

(6) Q Do you remember if the – the initial 700 (7) prototype design had two temperature probe inputs to the (8) microprocessor?

(9) A I know it has two temperatures – two (10) temperature sensor, yes. To the microprocessor, I'm sure (11) it did.

(12) Q The first version that went out?

(13) A I don't remember now.

(14) Q You don't know. Do you know if the first (15) version could compare temperature values for the two (16) sensors?

(17) A No, I don't remember that.

(18) Q Did the – did the initial 700 system have (19) a freeze protection?

(20) A Yes, it had freeze protection.

(21) Q Do you remember how that system (22) implemented the freeze protection?

(23) A I know we had a freeze on our High Limit (24) Sensor, which were both the same sensor.

(25) How was it implemented? It was connected

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(1) to the – to the circuit board, was going through (2) electronics of the circuit board. And as far as at what (3) temperature, I don't remember.

(4) Q Putting aside the temperature, what did it (5) do? Did it turn on the pump, or did it turn on the pump (6) and the heater? Do you remember?

(7) A No, I don't.

(8) Q Okay. Now, you said – you said it (9) went through the circuit board. Did the 600 have freeze (10)

protection that didn't go through the circuit board?

(11) A No. The 600, as we saw the – the other, (12) the Sundance 600 schematic earlier, it is the same exact (13) way of Sundance does right now. And that's the same way (14) we did the 600 in '85.

(15) Q They didn't just use a freeze switch?

(16) A I think maybe an earlier version of '8 – (17) 1984 maybe six or four used the freeze switch, but none. (18) I think the 605, it was using the comparator.

(19) Q You said you think. Are you sure about (20) that?

(21) A I can look at – if I look at the (22) schematic, I tell you for sure, but I'm not sure about (23) that.

(24) Q Who has the schematics? Do you have – (25) does Sundance have it?

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(1) A Sundance doesn't have the schematic. (2) Balboa, I'm sure does.

(3) Q Did the – the Balboa 700 series have the (4) capability to maintain historical logs?

(5) A Do you mean the 700 series?

(6) Q Yes.

(7) A I don't think so.

(8) Q When you were with Balboa, were you ever (9) involved in any quality control meetings with personnel (10) of Sundance?

(11) A Yes.

(12) Q What were those meetings all about?

(13) A Meeting for the failure that – well, the (14) failures that they had in the field, what can we do to – (15) regarding the controls, and what can we do to improve (16) that.

(17) Q Was – there was a failure problem?

(18) A I mean if in case, for example, there is (19) something wrong with the board or – or – or the top (20) side panels or manufacturing, things like that, just the (21) ongoing meetings we had with Sundance once a month – (22) just basically we were working as one unit together to (23) try to make the unit better.

(24) Q Were there any complaints from Sundance (25) about the high failure rates?

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(1) A No, not – no. We had an ongoing (2) meetings, and we were just going – at some point we had (3) some problem with the top side panels; the lamination on (4) the LCD; things like just manufacturing problems, which (5) through those meetings we tried to take care of these (6) problems.

(7) Q You don't remember Sundance ever coming to (8) you or somebody else at Balboa and saying that the (9) failure rates were too high on the 700 series?

(10) A Not to me, no. I don't remember that.

(11) Q Were you told that by anybody else at (12) Sun – at Balboa? I'm sorry.

(13) A No.

(14) Q Mr. Sadati, I'd like to have you take a (15) look again at the interrogatory answers –

(16) A Okay.

(17) Q – that you were looking at before.

(18) A What exhibit is that?

(19) Q It's not an exhibit.

(20) A Okay.

(21) (Counsel talking simultaneously.)

(22) MR. HEIM: Does he have one over here?

(23) THE DEPONENT: (Inaudible).

(24) MR. PAIN: No.

(25) MR. HEIM: No.

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(1) MR. PAIN: I have one here. I thought he had a (2) copy earlier.

(3) MR. HEIM: The one he had has a note on the (4) front from one of the court reporters about keeping a (5) copy of it with the exhibits. I think it may be the one (6) you have there, Louis. Does it say something about John (7) on it?

(8) MR. PAIN: Yeah.

(9) THE DEPONENT: Okay.

(10) MR. HEIM: I'll wait till your counsel finds his (11) copy.

(12) (Discussion held off the record.)

(13) MR. PAIN: All right. Proceed.

(14) MR. HEIM: Okay.

(15) Q When you were at Balboa, did you ever hear (16) why Sundance decided to develop its own controller?

(17) A Oh, no. I didn't know they were – at (18) that time I didn't know Sundance was developing their own (19) controller.

(20) Q If I could have you turn to page 3 of the (21) document of the Supplemental Answers, interrogatory (22) Number 3 asks Clark to – to provide the reasons why. It (23) says that the 215 patent is invalid, and then for each (24) claim Sundance has given us an answer. And I'd like to (25) go through those answers with you much as we did with the

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(1) Infringement questions.

(2) A Okay.

(3) Q With respect to Claim 1, it

says: (4) "Invalid because all elements of the (5) claim are either shown in or made obvious (6) by Spa-trol device which was available more (7) than one year prior to filing date of (8) patent and suit." (9) Are you familiar with the Spa-trol device? (10) A I've seen one unit recently.

(11) Q Okay. Have you done a study of that unit?

(12) A Minor.

(13) Q What have you done?

(14) A I just basically took a look at the unit (15) and tried to install it in the spa and tried to operate (16) it, and it partially worked. And it was not a perfect (17) unit so ...

(18) Q Okay. You said it partially worked. What (19) part worked?

(20) A The low-speed pump wasn't working, so I (21) had to do some manipulation to get the stuff running.

(22) Q Which - which model of - of the Spa-trol (23) device did you test?

(24) A I don't know. It was a one (25) microprocessor-based model.

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(1) Q Okay.

(2) A That's the only one I know.

(3) Q Do you have that?

(4) MR. PAIN: Do you want us to bring it up here?

(5) MR. HEIM: Yeah, well, we can at a break.

(6) MR. PAIN: I have it. If you want it, I'll go (7) get it.

(8) Q BY MR. HEIM: Let me just ask you: How (9) many temperature probe inputs does the Spa-trol device (10) have?

(11) A It has one temperature sensor, and there (12) was a mechanical High Limit.

(13) Q Okay. So there was no two temperature (14) probe - there were not two temperature probe inputs to (15) the microprocessor in the Spa-trol design; is that right?

(16) A No, I couldn't - I couldn't verify that. (17) I couldn't - I am not sure, because I didn't have the (18) schematic. I didn't have all - I think it was (19) basically - I didn't even have the temperature sensor (20) there. I had to just use the resistor to manipulate (21) that.

(22) Q Did you have the interface board?

(23) A Yes.

(24) Q Okay. There is only one connector (25) available for a temperature sensor on that board, isn't

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(1) there?

(2) A Yes, right.

(3) Q Do you know how the Spa-trol device (4) implemented freeze protection?

(5) A Seems like when I - I lowered the (6) temperature to - I mean, I used a little potentiometer (7) to - for the thermistor. And when I went to, like, 40, (8) approximately 40 degrees, it would - there was an LED (9) for the freeze sensor lit up.

(10) So as I said, the - the low-speed pump (11) wasn't working, so I didn't know if it was sending a (12) signal to a pump or not.

(13) Q Was the heater working?

(14) A Yeah, the heater was fine.

(15) Q Did it turn on the heater when the (16) temperature dropped below that threshold value?

(17) A I don't think so.

(18) Q It - so it may have turned on the pump?

(19) A Right.

(20) Q But it didn't turn on the heater?

(21) A No, I don't think so.

(22) Q Do you have the patent in front of you (23) anywhere?

(24) A I'm sure ...

(25) MR. PAIN: There you go.

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(1) MR. HEIM: Let me see if I can find it - I -

(2) MR. PAIN: I've got one.

(3) MR. HEIM: I need to find one for myself.

(4) MR. PAIN: Oh.

(5) (Pause in proceedings.)

(6) Q BY MR. HEIM: If I could direct your (7) attention back to Claim 1, which is on Bates number (8) S00020 -

(9) A All right.

(10) Q - column 21.

(11) A Yes.

(12) Q Claim 1 says - it says "a first sensor," (13) "a second sensor," and it says "the microcomputer (14) processes signals generated by the sensors." (15) The Spa-trol device doesn't do that, does (16) it?

(17) A The Spa-trol has microprocessor, and it (18) has temperature sensor. It also has High Limit Sensor (19) that - but as far as I could tell, the High Limit Sensor (20) is - it's shutting the whole system down and basically (21) shuts the microprocessor down.

(22) But maybe it's not sending the signal to (23) the - to the microprocessor directly, but it will shut (24) the processor down.

(25) Q So the microprocessor doesn't process any

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(1) signal from the High Limit Sensor on the Spa-trol device, (2) does it?

(3) A No, not in the unit that I had seen.

(4) Q Is there any other device that you know of (5) prior to that that would invalidate the 215 patent that (6) did - that had both the first and second sensor that (7) provided inputs to a microprocessor?

(8) MR. PAIN: Would you repeat that question?

(9) MR. HEIM: Sure. I would be happy to.

(10) Q Do you know of any other prior art device (11) that you're going to contend invalidates Claim 1 other (12) than the Spa-trol device?

(13) A Yeah, I think Balboa does that.

(14) Q And that's based upon your belief that (15) that unit was available back in the 1986 or '87 - what (16) time period did you say?

(17) A Well, I mean, we started developing it (18) in '85 - the prototypes, it was done in '87.

(18) Q And what month did you say of '87?

(20) A I'm not sure as far as the month of '87.

(21) Q So you would supplement this answer to say (22) that the Balboa device also does that?

(23) A Yeah.

(24) Q Do you have any documentation that (25) supports that the Balboa device was completed as of that

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(1) date?

(2) A No, I don't have any documentation.

(3) Q Any other device that you know of?

(4) A Well, no, based on my knowledge. I worked (5) at Balboa and Sundance. Those are the only places I (6) can - that I know of.

(7) Q Other than the Spa-trol device and the (8) Balboa device - and I assume you're talking about the (9) Balboa 700?

(10) A Exactly.

(11) Q Other than the Spa-trol device and the (12) Balboa 700 device, is there any other product or any (13) other prior art that Sundance contends invalidates (14) Claim 1?

(15) MR. PAIN: Or that you know of.

(16) THE DEPONENT: No, I don't know of any.

(17) Q BY MR. HEIM: Okay. And you are the (18) corporate representative on the prior art issue; correct?

(19) A Yes.

(20) Q Claim 4 is the claim that has the (21) microcomputer calculating the difference between the (22) temperatures detected by the sensors. Do you see that in (23) the claim, Claim 4 of the patent? Claim 4, I can read it (24) if you like.

(25) A You're talking about this here

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- (1) (indicating)?
- (2) Q The patent, yes.
- (3) Where in the microcomputer it calculates (4) the difference between the temperatures detected by the (5) sensors.
- (6) A Uh-huh.
- (7) Q The Balboa - strike that.
- (8) The Spa-trol device could not do that, (9) could it?
- (10) A I can't tell you how the software was (11) written on that. If - if - no. If the - no.
- (12) Q It could not do it, could it?
- (13) A No. Because there's only one temperature (14) sensor.
- (15) Q Back in '87, the Balboa device couldn't do (16) that either, could it?
- (17) A To calculate the two different (18) temperature, no.
- (19) Q Is there any other prior art that you're (20) aware of that could do that?
- (21) A No, I don't know.
- (22) Q Let's go to Claim 37. Is it - let me ask (23) you this: Is it Sundance's contention that the (24) Spa-trol - Spa-trol device invalidates every claim of (25) the 215 patent?

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(1) A Yes. Most of the claims of the 21 - (2) yes, because I think that - I mean, the way I read it (3) here is it has a microprocessor and it has the (4) temperature sensor. And in my opinion, Spa-trol has a (5) microprocessor, has a temperature thermistor on. Balboa (6) unit has the same thing.

(7) Q Are you saying that it would have been (8) obvious to modify the Spa-trol device to add a second (9) temperature sensor?

(10) A Well, is it obvious that we can modify? (11) I'm sure that that unit is capable of it. I mean, that (12) microprocessor has probably 8-bit processor, same as (13) Sundance, same as Balboa, same as probably this unit.

(14) Q That's not the question I asked. I said: (15) Would it have been obvious at that time to modify the (16) Spa-trol device to add a second temperature sensor input (17) to the microprocessor?

(18) MR. PAIN: I don't understand the question, (19) Mike. I mean, I don't know what you're saying. Obvious (20) to whom?

(21) Q BY MR. HEIM: Well, I mean is that your (22) contention that it would have been obvious?

(23) MR. PAIN: Where do you pick up? How has he (24) ever said it was obvious?

(25) MR. HEIM: Let's go back and look at Claim 1.

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(1) Claim 1 says "invalid because all elements of the claim (2) were either shown in or made obvious."

(3) MR. PAIN: All right. Explain that to him (4) when - when you are asking the question.

(5) Q BY MR. HEIM: That's what I want to know. (6) Is that what you're - is that what you're saying?

(7) A Well, was it obvious? Yeah, I mean, if (8) you look at them, the Spa-trol was made in '70s, I (9) believe, which I didn't know. I - I first have heard (10) about Spa-trol is about twelve months ago or two and a (11) half months ago and -

(12) Q Did you ever hear of the Spa-trol device (13) when you were at Balboa?

(14) A No.

(15) Q Did anybody at Balboa say when they were (16) developing the 700 series, that we ought to go look at (17) the Spa-trol device?

(18) A I'm - I'm not sure. I - I don't know (19) that.

(20) Q Had you - you said the first Spa-trol (21) device you saw was a couple of months ago?

(22) A Yes.

(23) Q Is it your understanding that the Spa-trol (24) device - strike that.

(25) Is it your understanding that the company

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(1) who made the Spa-trol device went out of business?

(2) A I believe they are no longer in business, (3) yeah.

(4) Q Okay. Do you know why they went out of (5) business?

(6) A No, I don't know that.

(7) Q I'm looking at Claim 8. Can - were you (8) able to determine whether or not the Spa-trol device (9) could determine the rate of heating of the water?

(10) A No, I can't - no, I couldn't.

(11) Q So you don't know if the Spa-trol device (12) had that capability?

(13) A No.

(14) Q Did the Balboa 700 device in

1987 have (15) that capability?

(16) A Of controlling the - the rate of heating (17) as the claim says here?

(18) Q Yes.

(19) A No.

(20) Q It could not do that?

(21) A It couldn't do that.

(22) Q The Balboa device could not figure out the (23) time necessary to raise the temperature of the water from (24) one temperature to another temperature?

(25) A No, we didn't do that. The way we did

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(1) that was the same that we do the 800 right now.

(2) Q Was the - was the Spa-trol device able to (3) monitor the voltage of the power source?

(4) A I - I don't know.

(5) Q Was the Balboa 700 system in 1987 capable (6) of monitoring the voltage of the power source?

(7) A No.

(8) Q Did the Balboa 700 series in 1987 have (9) freeze protection?

(10) A Yes.

(11) Q What type of freeze protection did it (12) have?

(13) A Thermistor, High Limit/Freeze.

(14) Q What was the procedure by which the (15) Bal - the Balboa device performed freeze protection?

(16) A I don't remember right now.

(17) Q Do you remember if it just turned on the (18) pump or did it turn on the pump and the heater? Do you (19) remember any of that?

(20) A No, I don't.

(21) THE VIDEOGRAPHER: Ten minutes left on this (22) tape.

(23) Q BY MR. HEIM: And you said the Spa-trol (24) device only activated the pump, as far as you can tell; (25) is that right?

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(1) A I said the pump - low-speed pump wasn't (2) working, so I couldn't tell if it was activating it or (3) not.

(4) Q So you don't even determine that?

(5) A I couldn't determine that.

(6) Q Is there anybody else at Sundance who has (7) or who has been asked to perform tests on the Spa-trol (8) device?

(9) A No.

(10) Q Did the Balboa 700 series in 1987 have (11) optical isolation circuitry?

(12) A '87?

(13) Q Yes.

(14) A No.

(15) Q Did the Spa - does the Spa-trol device (16) have optical

isolation circuitry?

(17) A Yes.

(18) Q It does have that?

(19) A Yes.

(20) Q Does it have it for the pump and heater?

(21) A Yes.

(22) Q What - the Spa-trol device, does it use a (23) microcontroller?

(24) A Yes.

(25) Q Do you know who is the manufacturer of

Page 169

(1) that?

(2) A No. I can't remember right now. I - I (3) was trying to find data books, and it was discontinued.

(4) Q With respect to - to all of these (5) invalidity positions of Sundance, is there any device - (6) and as to all the claims, is there any device or prior (7) art other than Spa-trol or Balboa that Sundance will be (8) relying for - relying on for invalidity?

(9) MR. PAIN: That's not a question. He knows (10) that's not his determination, Mike. All he is here is to (11) tell you what - what Sundance knows. Whether we have (12) other evidence or not, he doesn't know it, and he's not (13) going to tell you if he did know.

(14) MR. HEIM: He's not going to tell me, if he did (15) know?

(16) MR. PAIN: (Inaudible.) All you're doing is (17) talking to him about his knowledge of what he knows about (18) prior art and invalidity of the pact.

(19) MR. HEIM: I'm asking him as the corporate (20) representative what prior art you're going to rely on.

(21) MR. PAIN: Well, you can't ask him that. He's (22) not going to determine that. Our experts are going to (23) determine that. Just like you weren't going to reveal (24) your experts, we're not going to tell you our experts.

(25) MR. HEIM: Well, I'll tell you, I think - I

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(1) think you got a problem because you've got a court order (2) that's saying that as of last September you need to tell (3) us what prior art you're going to be using or relying on (4) for invalidity, and so we - we can deal with that (5) later.

(6) Q I want to know what other products of (7) prior art patents or publications do you know of that you (8) believe invalidate -

(9) MR. PAIN: That's a good question.

(10) Q BY MR. HEIM: - that

invalidate any of (11) the claims of the 215 patent?

(12) MR. PAIN: I don't mind him answering that (13) question. That's not the question you asked.

(14) THE DEPONENT: I don't know any.

(15) Q BY MR. HEIM: Those are the only two you (16) know of?

(17) A Yes.

(18) Q Are you familiar with a - a Baker-Hydro (19) product?

(20) A No.

(21) Q You've never seen that product before?

(22) A No.

(23) Q Have you ever seen any literature on the (24) Baker - Baker-Hydro product?

(25) A No, I don't.

Page 171

(1) Q What about a Ramco product?

(2) A I heard of - I've heard of - of Ramco, (3) but I never - no, no, I can't.

(4) Q You don't know?

(5) A I've heard - I've heard that name.

(6) Q You don't know what type of product they (7) had prior to 1987?

(8) A No, I don't.

(9) Q What about a company called Nemco?

(10) A No.

(11) MR. HEIM: That's all the questions I have.

(12) MR. PAIN: Okay.

(13) THE VIDEOGRAPHER: Off the video record. End of (14) Volume I, Tape 2 at 2:22.

(16) (Whereupon, at the hour of (17) 2:22 p.m., the proceedings (18) were concluded.)

(19) -00-

Page 172

(1) I certify that the foregoing is true and (2) correct.

(6) Executed at
on

(place) (Date)

(9) (Signature of Deponent)

Page 173

(1) NOTARIAL CERTIFICATE

(3) STATE OF)
) SS. (4) COUNTY OF)
)

(6) On this day of
, 199 , (7) before
me

(8) personally appeared,

(9) personally known to me (or proved to me on the basis of (10) satisfactory evidence) to be the person whose

name is (11) subscribed to the foregoing deposition transcript, and (12) acknowledged that he/she executed same.

(15)

(Signature of Notary) (Seal of Notary)

Page 174

(1) STATE OF CALIFORNIA)

) SS. (2) COUNTY OF LOS ANGELES)

(4) I, Kristen D. Poissonnier, Certified (5) Shorthand Reporter, Certificate Number 10669, for the (6) State of California, hereby certify:

(7) The foregoing proceedings were taken (8) before me at the time and place therein set forth, at (9) which time the deponent was placed under oath by me; (10) The testimony of the deponent and all (11) objections made at the time of the examination were (12) recorded stenographically by me and were thereafter (13) transcribed; (14) The foregoing transcript is a true and (15) correct transcript of my shorthand notes so taken; (16) I further certify that I am neither (17) counsel for nor related to any party to said action, nor (18) in any way interested in the outcome thereof.

(19) In witness whereof, I have hereunto (20) subscribed my name this 18th day of December 1995.

(24)

Kristen D. Poissonnier, CSR

(25) Certificate No. 10669

OWNER'S MANUAL



"THE SYSTEM 110" SS110HBD FOR SPAS AND HOT TUBS

"THE SYSTEM" LIMITED WARRANTY

Sta-Rite Industries, Inc. ("Sta-Rite") warrants to the original consumer purchaser ("Purchaser") of products manufactured by it that they are free from defects in materials or workmanship.

If within TWENTY-FOUR (24) months from date of installation, the logic board should prove to be defective, it shall be repaired or replaced at Sta-Rite's option. If any other product shall prove to be defective within TWELVE (12) months from date of installation, it shall be repaired or replaced at Sta-Rite's option. Purchaser must pay all labor and shipping charges necessary to replace the product covered by this warranty. This warranty shall not apply to any product that has been subject to negligence, misapplication, improper installation or maintenance, or other circumstances beyond Sta-Rite's control.

Requests or service under this warranty shall be made by contacting the installing Sta-Rite dealer as soon as possible after the discovery of any alleged defect. Sta-Rite will subsequently take corrective action as promptly as reasonably possible. No requests for service under this warranty will be accepted if received more than 30 days after the term of this warranty.

This warranty sets forth Sta-Rite's sole obligation and purchaser's exclusive remedy for defective products.

STA-RITE SHALL NOT BE LIABLE FOR ANY CONSEQUENTIAL, INCIDENTAL OR CONTINGENT DAMAGES WHATSOEVER.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS WARRANTIES. IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, SHALL NOT EXTEND BEYOND THE DURATION OF THE APPLICABLE EXPRESS WARRANTIES PROVIDED HEREIN.

Some states do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above limitations or exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

WATER EQUIPMENT DIVISION

STA-RITE INDUSTRIES, INC., DELAVAN, WISCONSIN 53115

NATIONWIDE CUSTOMER SERVICE: Santa Fe Springs, California • Orlando, Florida
Oklahoma City, Oklahoma • Chamblee, Georgia • Ledgewood, New Jersey

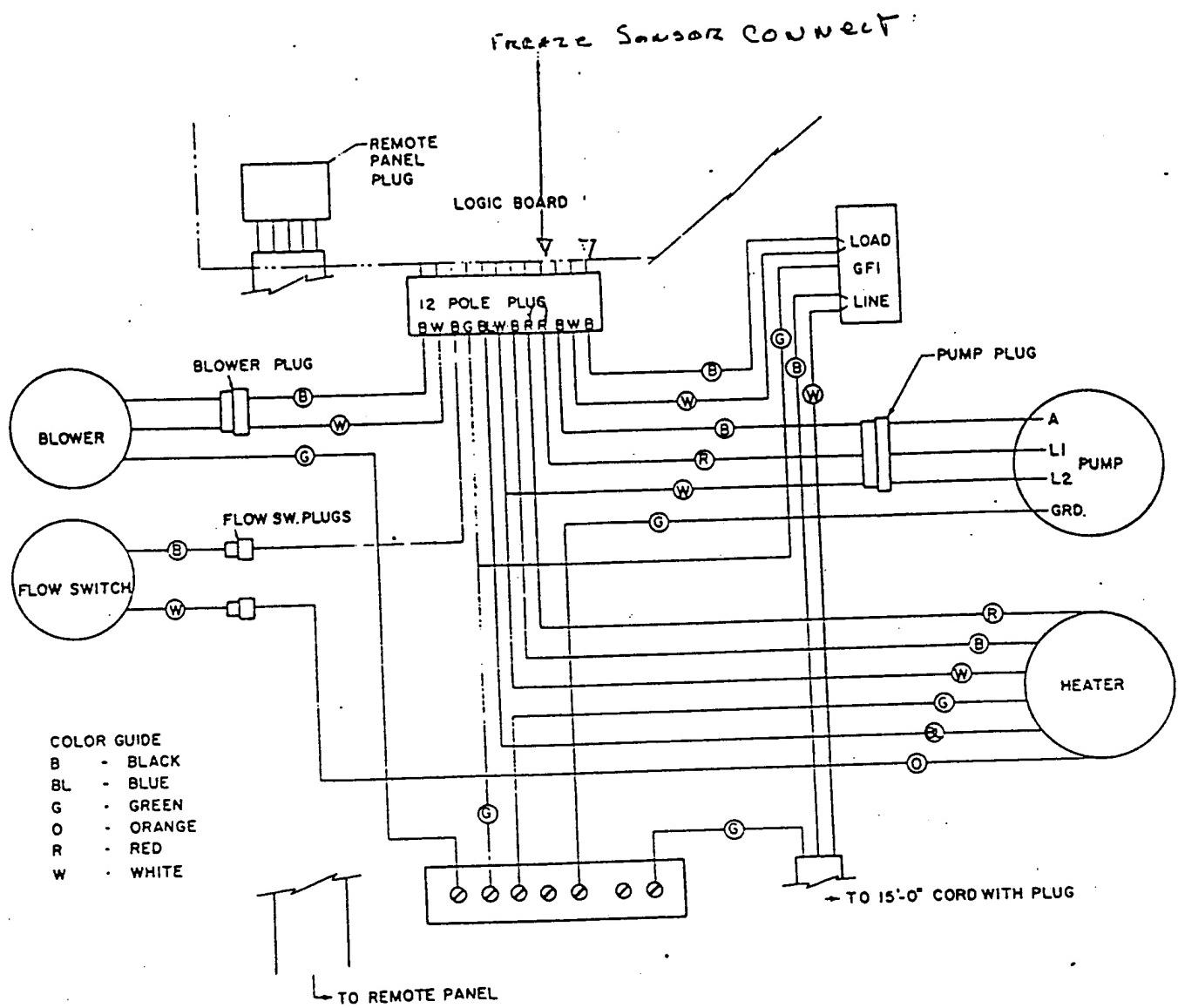


FIGURE 2

6. UNCRATING

"The System 110" is placed on a wooden skid for protection and ease of handling during shipment. The cardboard carton should be removed from around the skid prior to removing "The System 110" from the skid. Lift "The System 110" by the base only—DO NOT LIFT THE EQUIPMENT BY HOLDING ON TO THE PIPING! This could cause pipe leakage after installation and could cause damage to the equipment.

7. TYPICAL INSTALLATION DIAGRAM

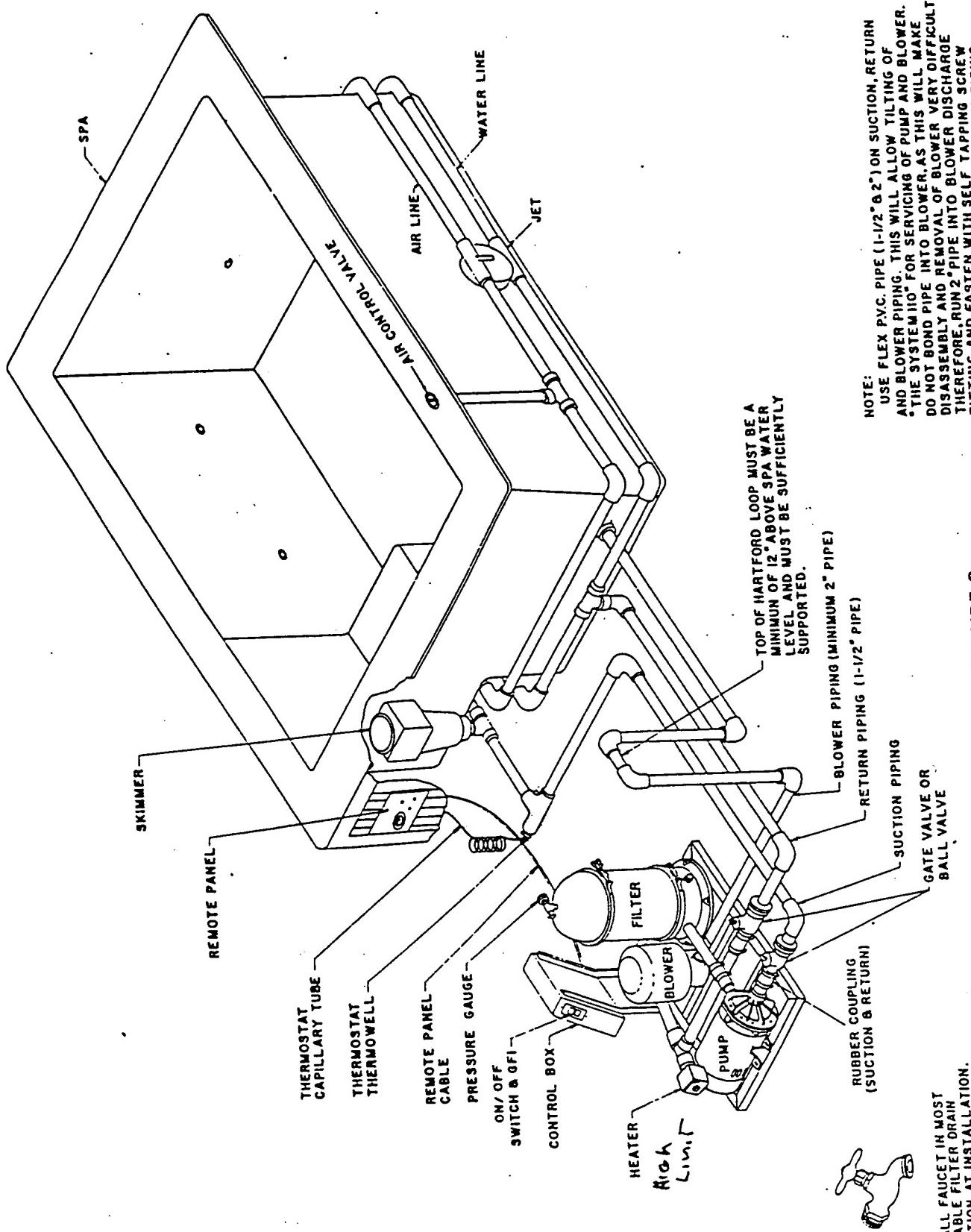


FIGURE 3

012245

INSTALLATION OF THERMOSTAT THERMOWELL IN SUCTION PIPING

(USE MID-BRANCH METHOD WHENEVER POSSIBLE.
THIS WILL MINIMIZE EROSION OF THERMOWELL IN WATER STREAM).

IMPORTANT: BE SURE TO INSULATE TEE AND ALL PIPING WITHIN APPROXIMATELY 12" OF TEE TO
MINIMIZE HEAT LOSS. HIGH HEAT LOSS CAN CAUSE EXCESSIVE HEATER CYCLING.
DO NOT INSTALL TEE SUCH THAT MIDDLE BRANCH POINTS ABOVE HORIZONTAL THIS COULD
ALLOW SENSING BULB TO BE SURROUNDED BY AIR, CAUSING INACCURATE SENSING.

FIGURE 4

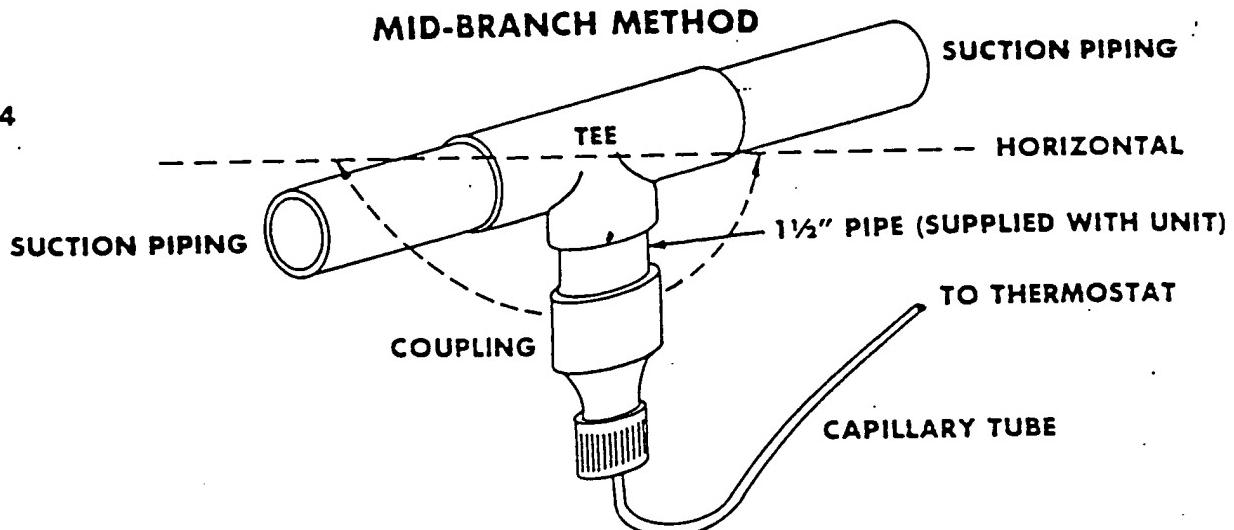


FIGURE 5

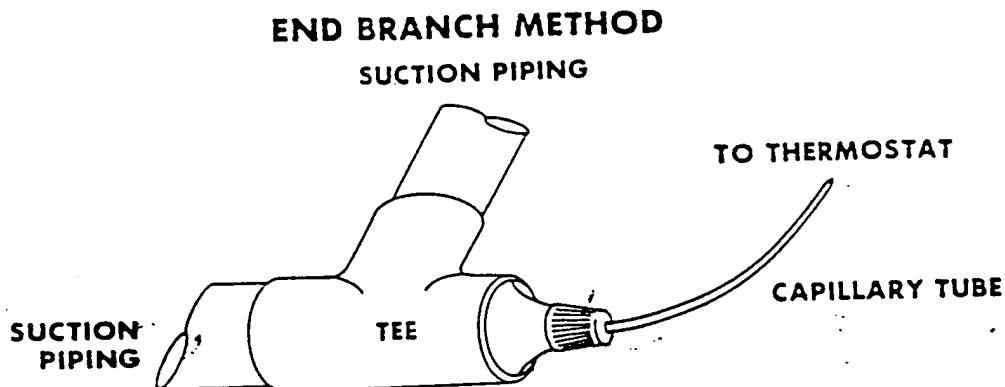
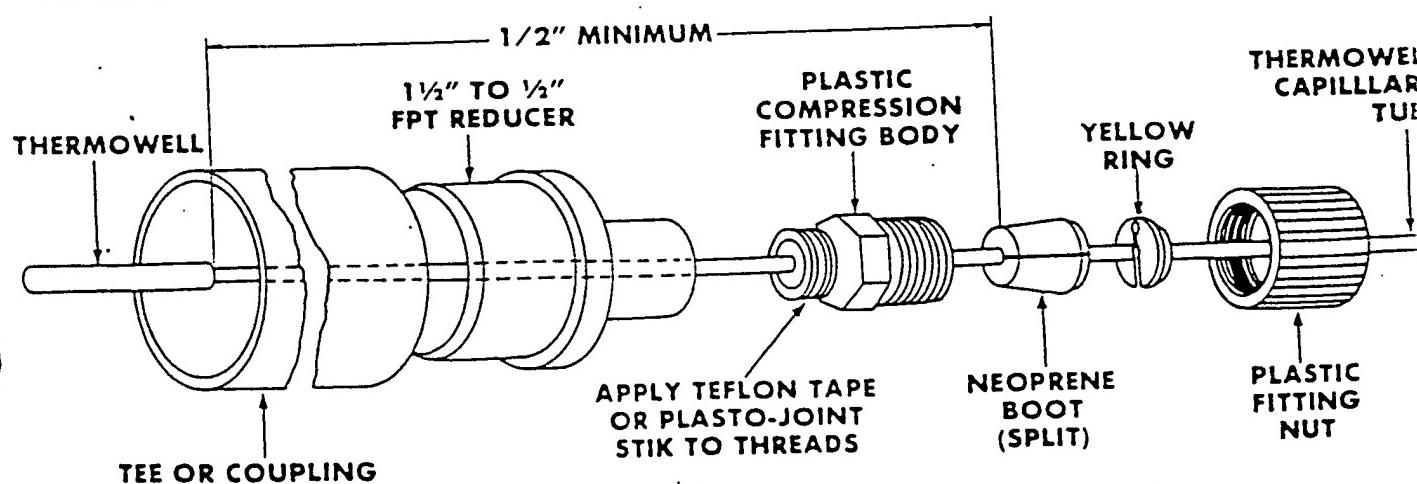


FIGURE 6

THERMOWELL INSTALLATION EXPLODED VIEW



10. AIR BLOWER PIPING

IT IS ESSENTIAL THAT THE AIR BLOWER PIPING BE AS FOLLOWS:

THE PIPE DIAMETER MUST NEVER BE LESS THAN 2". Use of smaller piping will void the blower warranty, severely restrict blower output, and cause excessive blower motor heat build-up. This condition would result in severely shortened service life of the blower and premature burn-out of the motor.

THE BLOWER RETURN PIPING MUST HAVE A "HARTFORD LOOP" CONSTRUCTED, which will extend a minimum of 12" over the highest possible water level in the spa/hot tub. This will prevent water from surging through the air piping and entering the motor windings of the air blower. This could cause severe electrical shock hazard to any people in the water, and would cause damage to the blower.

TOTAL PIPE LENGTH OF THE AIR RETURN LINE SHOULD NOT EXCEED 25 FT. Longer pipe runs will increase the restriction of blower output, cause higher blower operating temperatures, and decreased bubbling action in the spa/hot tub.

CAUTION: IF THE AIR BLOWER PIPE JOINTS ARE CEMENTED TOGETHER, THE GLUE JOINTS MUST CURE FOR AT LEAST 24 HOURS PRIOR TO TURNING ON THE BLOWER. Fumes from the glue could be contained in the piping, and the fumes are highly flammable. Electrical sparks from the blower motor could ignite the fumes, if they are not allowed to escape during the cure time.

It is recommended that the air piping not be cemented into the 2" discharge port on the blower, to allow easier service or replacement. A self-tapping screw is adequate to secure this connection.

CAUTION

TO ASSURE ELECTRICAL SAFETY IN SPAS/HOT TUBS EQUIPPED WITH AIR BLOWERS, IT IS RECOMMENDED THAT AIR BLOWERS BE PIPED ONLY INTO "AIR CHANNELS" WITH NUMEROUS DRILLED AIR HOLES. PIPING AIR BLOWERS INTO THERAPY JET FITTINGS CAN CAUSE WATER UNDER PRESSURE TO BACK-UP INTO THE AIR BLOWER IF SOME OR ALL OF THE JET FITTINGS ARE BLOCKED OFF BY BATHERS. THIS WILL CAUSE SERIOUS SHOCK HAZARD POTENTIAL.

11. CIRCUIT REQUIREMENTS

Plug "THE SYSTEM 110" into receptacle on a 20 amp, 115 volt grounded circuit only. Circuit must be isolated in such a way that no other electrical appliances and lights draw current from the circuit. **CAUTION: WE RECOMMEND THE USE OF A 20 AMP GROUND FAULT INTERRUPTER RECEPTACLE IN OUTLET TO PROTECT AGAINST SHOCK FROM CORD.** Consult a licensed electrician if a 20 amp., 115 volt current is not available. **DO NOT USE EXTENSION OR DROP CORD.**

Do not locate cord where physical damage could occur to it. If cord must be placed in a heavily traveled area, protect it from wear and fraying, which could cause a shock hazard. **PROTECT ELECTRICAL CORD FROM COMING IN CONTACT WITH WATER.**

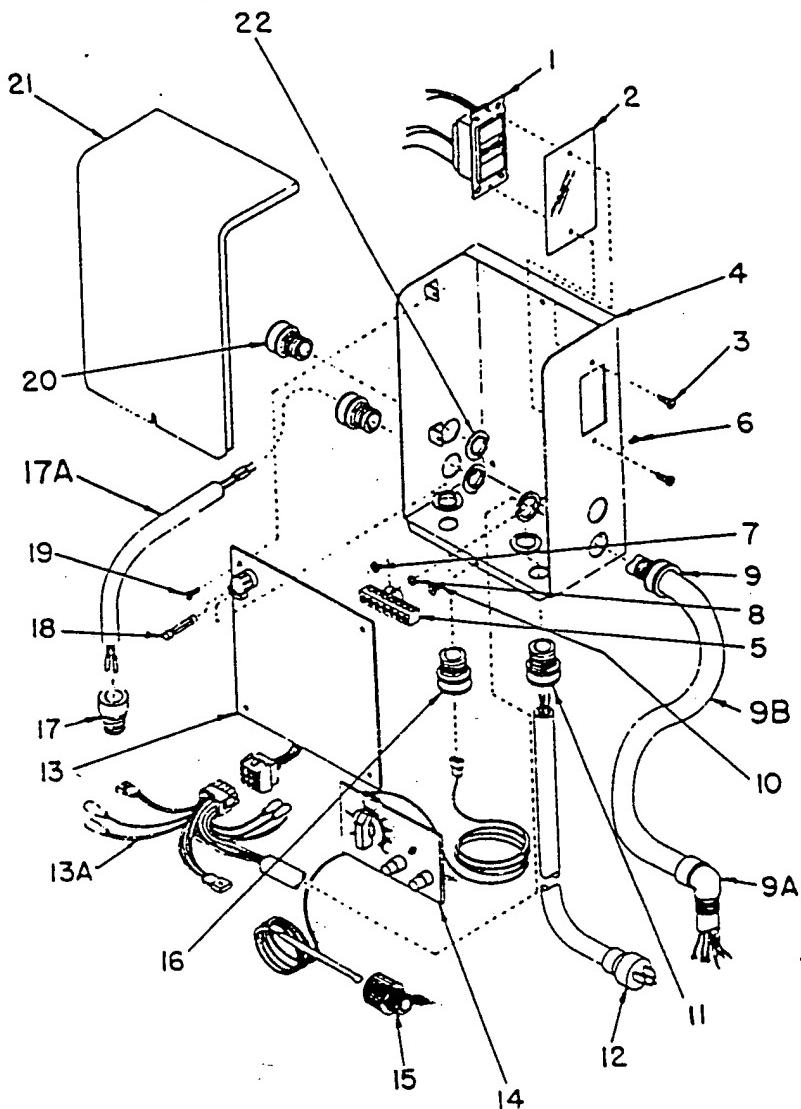
12. REMOTE PANEL AND THERMOWELL INSTALLATION

Install remote panel at location desired at the spa/hot tub site. BE SURE that water does not come in contact with rear side of panel and that a positive drain exists behind the panel should any water leak to this location. If front side of panel is expected to come in contact with water, lay a bead of RTV silicon sealant around edge of panel before panel is secured to the mounting surface.

Install thermowell in suction piping as shown in Figure 4 as close to the spa/hot tub as possible. This will enable the most accurate sensing of spa/hot tub water temperature and will allow minimum of time between spa/hot tub water cool down and heater start-up to maintain temperature. If thermowell is installed in middle section of tee, be sure tee points to side or down as shown in Figure 4 such that thermowell is completely immersed in water for accurate temperature sensing. If installed vertically, thermowell could be surrounded by air which would cause incorrect temperature sensing.

To install thermowell into plastic compression fitting in tee assembly, disassemble fitting and thread body of fitting into reducer. Then, slip plastic fitting nut, yellow ring and neoprene boot onto thermowell capillary tube. Yellow ring and neoprene boot are split such as to allow them to be slipped onto capillary tube without having to slip over thermowell. With neoprene boot at least $\frac{1}{2}$ " away from thermowell and capillary tube junction, assemble and tighten plastic fitting. Thermowell is now installed.

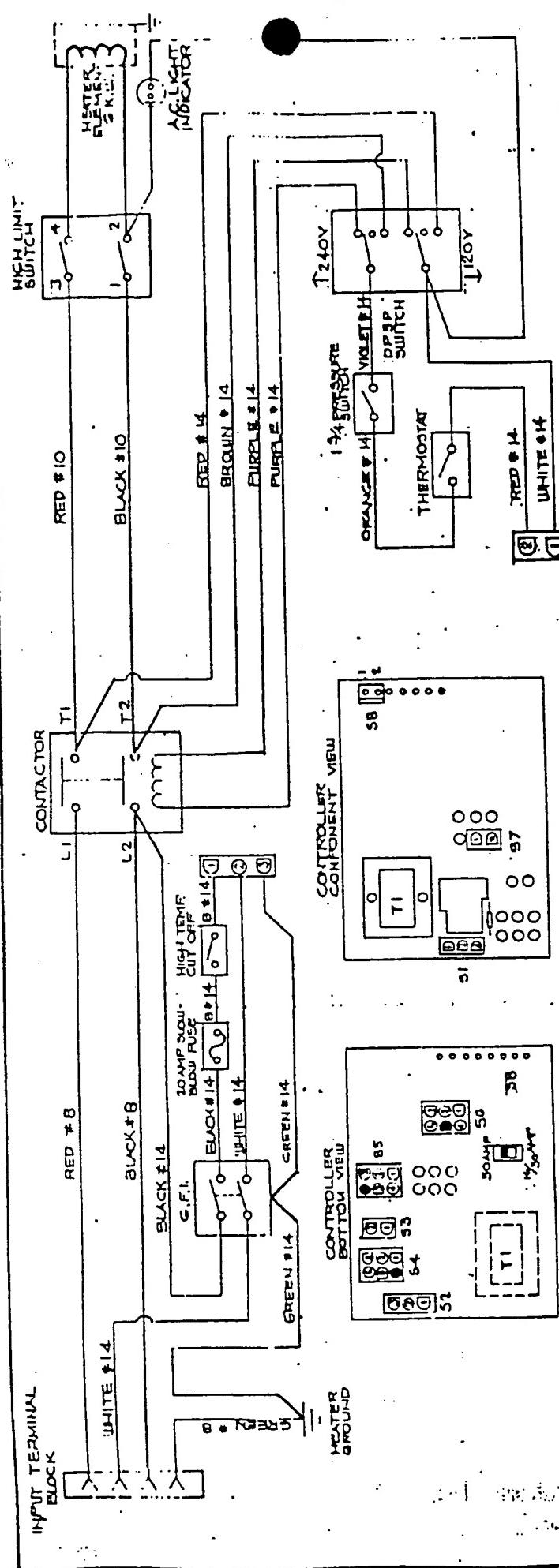
CONTROL BOX EXPLODED VIEW



CONTROL BOX REPAIR PARTS LIST

Key No.	Part Description	No. Used	Part Number
1	Ground Fault Interrupter	1	U17-716A
2	Cover	2	WC3-46P
3	Screw - #6 - 32 x 1/2" Lg.	2	U30-402C
4	Control Box Shell	1	WC117-93B
5	Ground Bar	1	U17-717
6	Screw - #8 - 32 x 3/8" Lg.	1	U30-143SS
7	Nut - #8 - 32	1	U36-52SS
8	Lockwasher - 1/4"	1	U43-23SS
9	Connector	1	WC117-100
9A	Connector	1	WC117-103
9B	Heater Cord	1	WC17-108
10	Screw - #10 x 3/8" Lg.	1	U30-842
11	Connector	1	WC117-102

Key No.	Part Description	No. Used	Part Number
12	Cord & Plug Assembly	1	U17-715
13	Logic Board	1	WC17-96
13A	Wire Harness w/Heater Cord	1	WC17-109
14	Remote Panel	1	WC17-95
15	Compression Fitting	1	WC117-95
16	Connector	1	WC117-97
17	Connector	2	WC117-101
17A	Flow Switch Cord	1	WC17-107
18	Fuse - AGC - 0.10 Amp - 250 Volt	1	U17-723
19	Screw - #10 x 3/8" Lg.	5	U30-842
20	Connector	1	WC117-98
21	Cover - Control Box	1	WC17-948
22	Locknut	6	U30-112C



Fettee Conn.
ST-800

10

- NOTES:**

 1. TO INSTALL INTERLOCK; RESISTOR R9 LEADS MUST BE CLIPPED AND R9 REMOVED.
 2. TO INSTALL TIME CLOCK P2 IS TO BE REMOVED AND DISCARDED.
 3. FUSE MUST BE U.L. APPROVED 3A 20 AMP SLOW-BLOW.
 4. "P" FOLLOWED BY A NUMBER IS A PLUG CONNECTOR'S FOLLOWING NUMBER IS A SOCKET

P2 TIME CLOCK JUMPER

F4	BLACK * 18	WHITE * 19	LIGHT	AIR SHUT-OFF
C-1				
E-7				

GND: #4 GROUND

RED * 16

RED * 17

RED * 18

RED * 19

CONTROLLER FUNCTIONS		WITH AMMETER SWITCH IN 10 AMP POSITION				NO ECO APP DATE	
MODE	LOW	HIGH	POWER	HEATER	BW	3	4
1	ON	OFF	OFF	OFF	ON	ON	ON
2	OFF	ON	ON	ON	OFF	OFF	OFF
3	ON	OFF	ON	ON	OFF	OFF	OFF
4	OFF	ON	ON	ON	OFF	OFF	OFF

NOTE:
WITH AMMETER SWITCH IN 50 AMP POSITION HEATER IS ON AS NEEDED IN ALL MODES.

NOTE THE 13th
EDITION THIS IS LATER
FOR FREEZING COUNTDOWN

INSTALLATION AND OPERATION MANUAL



ST-1100 CONTROL CENTER

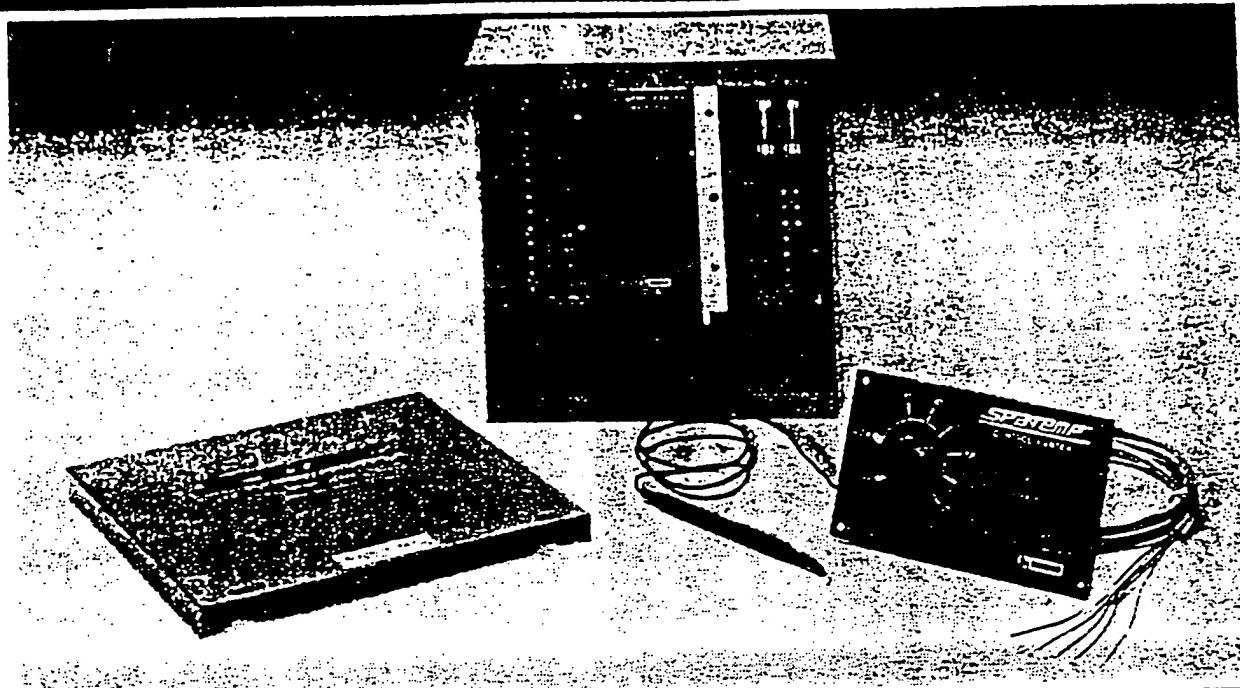


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RAMCO MFG., INC. 1086 North 11th Street, San Jose, Calif. 95112 (408) 998-4500
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012250

LOW VOLTAGE TEST

- LOW VOLTAGE TEST**

 1. Turn off all power at breakers.
 2. Remove equipment board can cover and remove all 6 spa control low voltage wires on the right side of the equipment board.
 3. Turn ON main power. CAUTION — LEFT HAND SIDE OF EQUIPMENT BOARD WILL NOW BE LIVE.
 4. Using jumper wire on right side of board (DC side)
 - A. Jump RED TERMINAL to BLACK TERMINAL.
Pump (Jets) should turn ON.
 - B. Jump RED TERMINAL to BLUE TERMINAL
Blower should turn ON.
 - C. Jump RED TERMINAL to BLACK TERMINAL and to WHITE TERMINAL
Pump should turn ON and heater should FIRE. If heater does not fire, turn off breakers, remove heater wires in Spa-Temp HEATER terminals and twist together. Turn on breakers and jump RED terminal to BLACK terminal — pump should turn ON and heater should FIRE. If heater doesn't fire the problem is in the heater or in the wiring from the heater to the HEATER terminals. If heater fires, return Equipment Board to RAMCO for repair.

If all the tests in Step 4 are positive, the problem is in the low voltage wire or the CONTROL PANEL.

Check all the following:

- Check all the following:**

 1. 6 conductor wire damaged—replace wire and waterproof splices per Section 2.1 (Figure 8), page 4.
 2. Splices in 6 conductor wire not waterproofed thus causing intermittent functioning. Resplice using waterproofing method in Section 2.1 (Figure 8), page 4.
 3. Thermostat switch filled with water—heater or READY light won't turn OFF.
Dry switch with hair dryer set on "low" for 15 minutes to drive water out of switch. Determine reason for water backing up behind Control Panel and correct problem. REVIEW Section 2.1. Seal down faceplate with clear silicone sealant.
 4. Pushbutton switches filled with water because seals were damaged on back of switches and correct drainage was not provided for back of faceplate. Send Control Panel to Ramco for repair and provide positive drain per Section 2.1

4.0 ACCESSORIES

IN HOUSE REMOTE CONTROL

Pump switch controls pump. "Ready" light illuminates when spa reaches desired temperature. Spa-Temp switch deactivates spa-side controls and keeps heater OFF. Can be used with or without time clock.

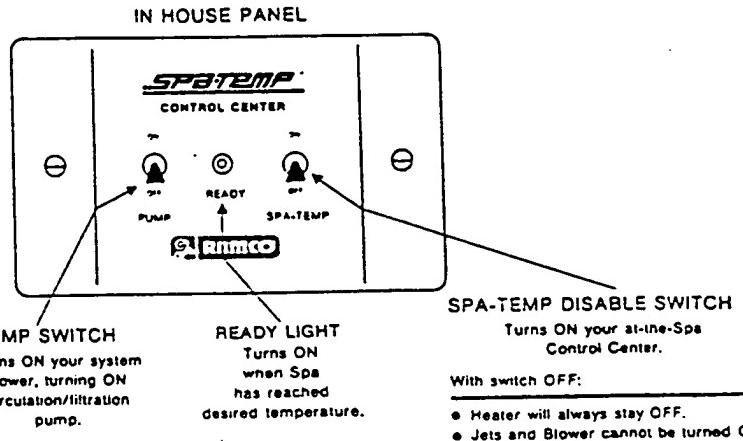
IN-HOUSE PANEL: Brushed stainless steel.

INPUT POWER: 115 Volt or 230 Volt

IN-HOUSE VOLTAGE: 6 Volt D.C.

IN-HOUSE VOLTAGE: 3 VOL D.C.
(no conduit required).
INSTALLATION HARDWARE INCLUDED: Sheet
rock box to mount in-house control, 30 feet
of conductor cable, wire nuts, hardware.

For single speed pump system — ORDER ST-1150A
For 2 speed pumps and 2 pump systems — ORDER ST-1150

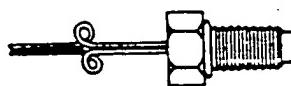


HOW TO USE YOUR IN-HOUSE REMOTE CONTROL

PUMP SWITCH	SPA-TEMP SWITCH	WHAT HAPPENS
OFF	OFF	<ul style="list-style-type: none"> Filtration pump OFF Time clock turns filtration pump ON and OFF. Heater, Jets & Blower remain OFF (at-Spa Control Center inactivated)
ON	OFF	<ul style="list-style-type: none"> Filtration pump ON. Heater, Jets, Blower remain OFF (at-Spa Control Center inactivated)
ON	ON	<ul style="list-style-type: none"> Turns ON entire Spa System. Filtration pump ON Heater—ON At Spa Control Center activated Ready Light ON when Spa reaches desired temperature.
OFF	ON	<ul style="list-style-type: none"> Everthing OFF until time clock turns system ON—then entire system turns ON and comes up to temperature ready for use. Makes use of time clock programming.

FREEZE PROTECTION — ST-800

Reads water temperature in plumbing and turns ON pump when freezing is sensed. Completely passive — draws no power during stand-by. Only operates system when needed for short periods of time.



2.4 BLOWER WIRING

Line power must be provided to ST-1100 terminals labeled LINE 3 and LINE 4 or blower will not function. LINE 3 and LINE 4 can be wired from separate breaker as shown or wired with jumper wires from LINE 1 and LINE 2 if codes permit.

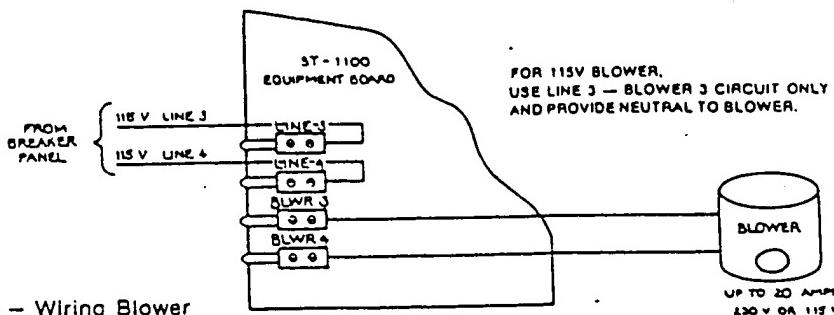


FIGURE 19 — Wiring Blower

2.5 HEATER WIRING

The two-SPA-TEMP "HEATER" terminals are internally connected to a small relay — when heat is needed, the relay closes, thus connecting the two "HEATER" terminals.

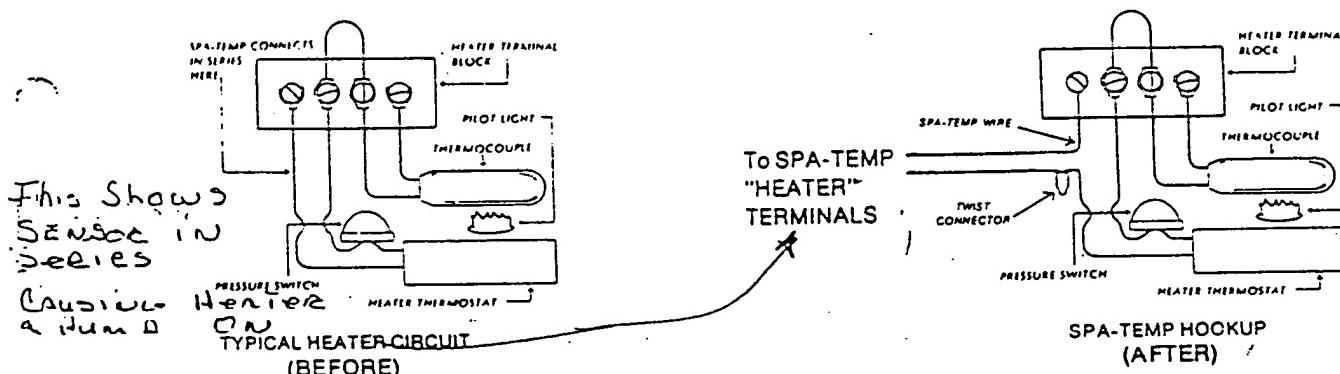
The internal "HEATER" terminals relay is limited to switching 25 VA and MUST NOT be wired in a manner requiring the relay to switch excessive power.

The relay is more than adequate to control gas millivolt systems, electronic pilotless gas systems, and electric heater contactors (power relays).

2.5.1 GAS MILLIVOLT HEATERS

Gas millivolt systems consist of a Thermocouple — Pressure Switch — Thermostat — Gas Valve circuit. SPA-TEMP "HEATER" terminals connect in SERIES anywhere in the circuit. If heater has OFF/ON switch, connection can be made in series with this switch.

**CAUTION: Do not bypass or disable heater pressure switch
OR FIRE MAY RESULT.**



NOTE: USE 18 gauge or heavier wire for heater wiring.

FIGURE 20 — Wiring Gas Millivolt Heater

CAUTION: Route wiring inside heater in such a manner that the wires cannot be melted by heater internal temperatures.

2.5.2 PILOTELESS GAS ELECTRONIC HEATERS

Electronic heaters use either 115V or 230V line power input. Connect the Spa-Temp HEATER terminals in series with the heater Line Input. Spa-Temp will then switch the input power to the heater.

CAUTION: Make sure you provide the correct input power for your heater. If your heater is internally wired for 115V and you provide 230V power, you may destroy the heater controls and the Spa-Temp internal "HEATER" Relay.

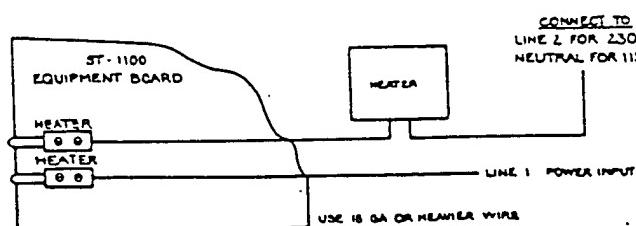


FIGURE 21 — Wiring Electronic Pilotless Gas Heater

LOW VOLTAGE TEST

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3. Thermostat switch filled with water—heater or READY light won't turn OFF.
Dry switch with hair dryer set on "low" for 15 minutes to drive water out of switch. Determine reason for water backing up behind Control Panel and correct problem. REVIEW Section 2.1. Seal down faceplate with clear silicone sealant.
4. Pushbutton switches filled with water because seals were damaged on back of switches and correct drainage was not provided for back of faceplate. Send Control Panel to Ramco for repair and provide positive drain per Section 2.1.

4.0 ACCESSORIES

IN HOUSE REMOTE CONTROL

Pump switch controls pump. "Ready" light illuminates when spa reaches desired temperature. Spa-Temp switch deactivates spa-side controls and keeps heater OFF. Can be used with or without time clock.

IN-HOUSE PANEL: Brushed stainless steel.

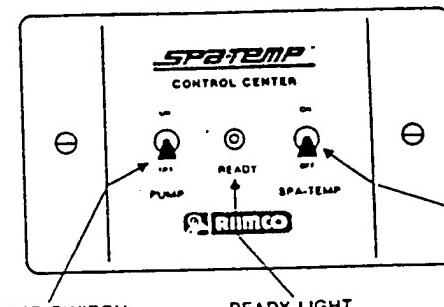
INPUT POWER: 115 Volt or 230 Volt.

IN-HOUSE VOLTAGE: 6 Volt D.C.
(no conduit required).

INSTALLATION HARDWARE INCLUDED: Sheet rock box to mount in-house control, 30 feet 6 conductor cable, wire nuts, hardware.

For single speed pump system — ORDER ST-1150A
For 2 speed pumps and 2 pump systems — ORDER ST-1150

IN HOUSE PANEL



PUMP SWITCH
Turns ON your system power, turning ON circulation/filtration pump.

READY LIGHT
Turns ON when Spa has reached desired temperature.

SPA-TEMP DISABLE SWITCH
Turns ON your at-the-Spa Control Center.

With switch OFF:

- Heater will always stay OFF.
- Jets and Blower cannot be turned ON.

HOW TO USE YOUR IN-HOUSE REMOTE CONTROL

<u>PUMP SWITCH</u>	<u>SPA-TEMP SWITCH</u>	<u>WHAT HAPPENS</u>
		<ul style="list-style-type: none"> • Filtration pump OFF • Time clock turns filtration pump ON and OFF. • Heater, Jets & Blower remain OFF (at-Spa Control Center inactivated)
		<ul style="list-style-type: none"> • Filtration pump ON. • Heater, Jets, Blower remain OFF (at-Spa Control Center inactivated)
		<ul style="list-style-type: none"> • Turns ON entire Spa System. • Filtration pump ON • Heater—ON • At Spa Control Center activated • Ready Light ON when Spa reaches desired temperature.
		<ul style="list-style-type: none"> • Everything OFF until time clock turns system ON—then entire system turns ON and comes up to temperature ready for use. • Makes use of time clock programming.

FREEZE PROTECTION — ST-800

Leads water temperature in plumbing and traps ON pump when freezing is sensed. Completely passive — draws no power during stand-by. Only operates system when needed for short periods of time.



INSTALLATION AND OPERATION MANUAL



ST-800 FREEZE PROTECTOR

WHEN INSTALLED WITH SPA-TEMP ST-1100 CONTROL CENTER

- FOR ONE PUMP (SINGLE SPEED) SYSTEM

Works directly with ST-1100 Control Center with or without ST-1150A In-House Control.

- FOR 2 SPEED PUMP AND 2 PUMP SYSTEMS

Install with ST-1150 In-House Control or ST-600 Electrical Interface.

WHEN INSTALLED WITHOUT SPA-TEMP ST-1100 CONTROL CENTER

- Install with ST-600 Electrical Interface to provide freeze protection for any pump to 2 HP/230V, 1 HP/115V.

DESCRIPTION

Senses actual water temperature in plumbing and turns pump ON when danger of freezing is sensed (40°F).

Turns pump OFF when water temperature rises to 50°F . Pump runs only for short periods of time when needed, taking advantage of spa "Thermal Mass."

The ST-800 freeze protector is designed to switch only the 6 volt D.C. Spa-Temp control signal — DO NOT CONNECT A.C. POWER TO THE ST-800 OR IT WILL BE DESTROYED!

Multiple ST-800 Freeze Protectors may be installed in parallel in a single pump piping line to provide multiple freeze protection sensor points.

READ ENTIRE INSTRUCTIONS BEFORE STARTING INSTALLATION

INSTALLING THE SENSOR

The sensor should be located in the plumbing area most likely to freeze. Typically this is the piping exposed to weather and near the spa pump. Install the sensor in a PVC Tee using the slip adaptor supplied. Tee should be on the SUCTION side of the pump as shown in Figure 1.

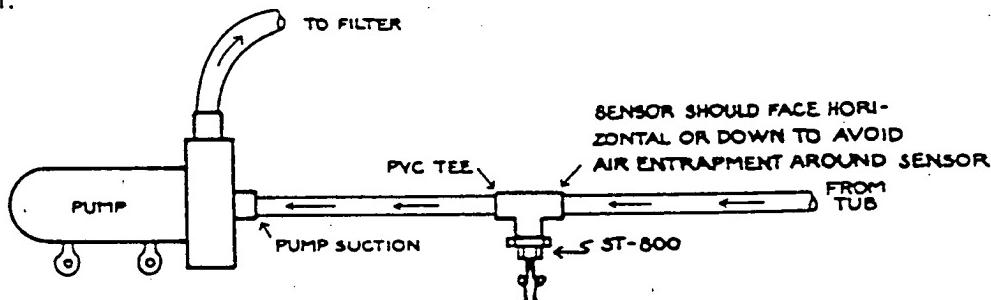


FIGURE 1 — INSTALLATION OF SENSOR

Multiple sensors may be installed (if desired) anywhere in the water circuit. The sensors must be wired in parallel as shown in Figure 2.

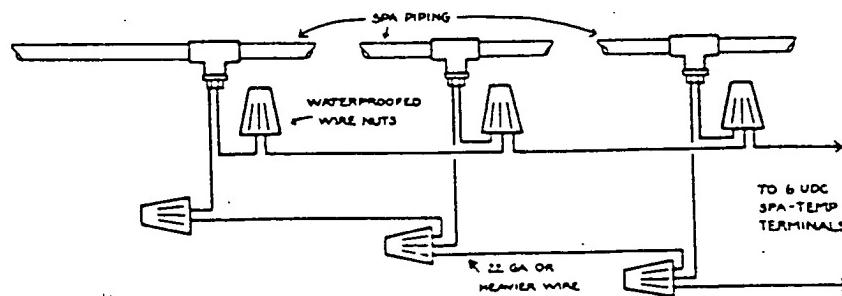


FIGURE 2 — MULTIPLE SENSOR INSTALLATION



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1.0 DESCRIPTION

The Spa-Temp ST-1100 Control Center by Ramco is designed to control all spa equipment from the comfort of your spa. The ST-1100 senses the water temperature directly in your spa and maintains selected temperature to within $\pm \frac{1}{2}$ F. Individual control buttons provide remote control of hydro therapy jets and bubble massage (blower). The "Ready" light shows when your spa has reached the selected temperature. The ST-1100 Control Center provides excellent performance and reliability when installed according to the instructions in this manual.

SPECIFICATIONS

PUMPS: Single speed pump, 2 speed pump, 2 pump systems.

Maximum size pump: 2 HP — 230 VOLTS/60 HZ
1 HP — 115 VOLTS/60 HZ

BLOWERS: 115 VOLT or 230 VOLT up to 20 AMPS.

HEATERS: Gas millivolt, pilotless electronic gas, electric, demand type gas water heaters.

INPUT POWER: 115 VOLT/60 HZ or 230 VOLT/60 HZ. Separate power input provided for blower (blower may be on separate breaker). Legal white NEUTRAL required when operated on 230 VOLT/60 HZ.

VOLTAGE AT SPA: 6 VOLTS D.C. — 100 MA MAXIMUM. Spa Control grounded. 6 VDC signal protected by 100 MA fast blow fuse.

1.1 CONTROL PANEL (FACEPLATE)

THERMOSTAT allows you to select desired temperature and maintains temperature to within $\pm \frac{1}{2}$ F.

READY LIGHT turns ON when spa reaches selected temperature, turns OFF when thermostat turns ON heater.

LOW position keeps spa in the 60-70° F range for standby.

OFF position keeps heater OFF.

JETS button turns Jets ON and OFF.

BLOWER button turns Blower ON and OFF.

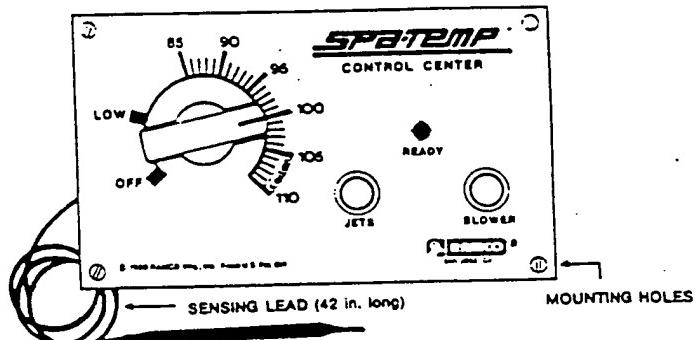


FIGURE 1 — Control Panel

1.2 EQUIPMENT BOARD (LOGIC BOARD)

HIGH VOLTAGE terminals switch and distribute power to spa equipment.

LOW VOLTAGE terminals are for connection to spa-side control panel, optional in-house controls and optional freeze protection (see Accessories, Section 4.0).

FUSE protects 6VDC power supply should a 6 VDC short circuit occur.

NOTE: Fuse must be tested with continuity meter as fuse wire is too fine to visually determine if "blown."

CONTROL CIRCUITRY works on 115 volts — a legal white "NEUTRAL" must be provided to NEUTRAL terminal.

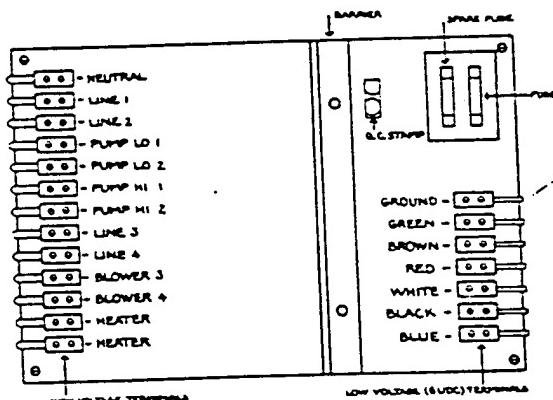


FIGURE 2 — Equipment Board

1.3 INTERNAL ELECTRICAL SCHEMATIC

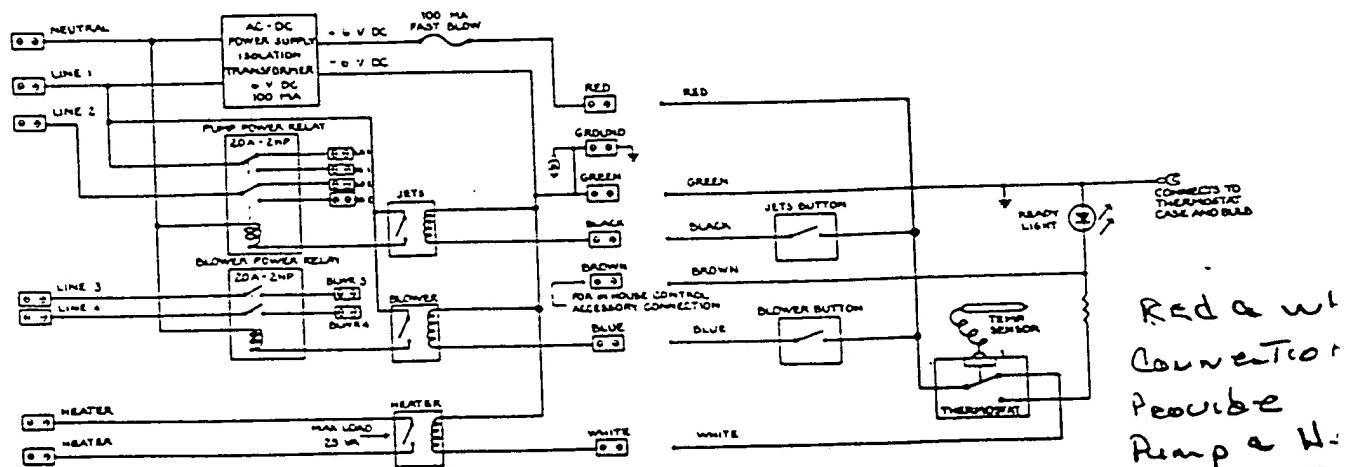
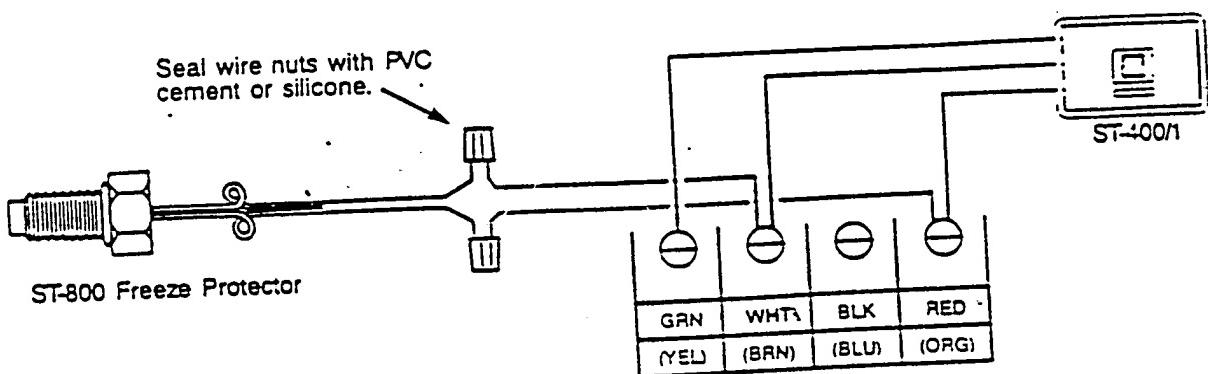


FIGURE 3 — Internal Electrical Schematic

ADDING FREEZE PROTECTION

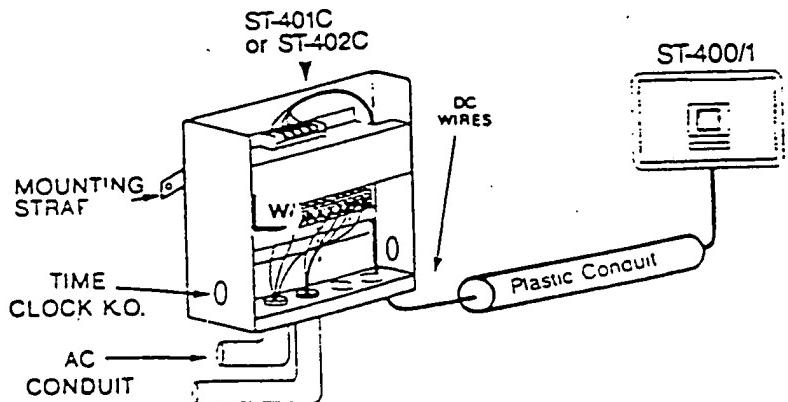


The ST-800 Freeze Protector will turn on at 40°F and off at 50°F. Connect Freeze Protector between the RED and WHT (BRN) DC terminals as shown. When freezing approaches, the ST-400/1 pushbutton. WHT (BRN) channel just like pushing the ST-400/1 pushbutton.

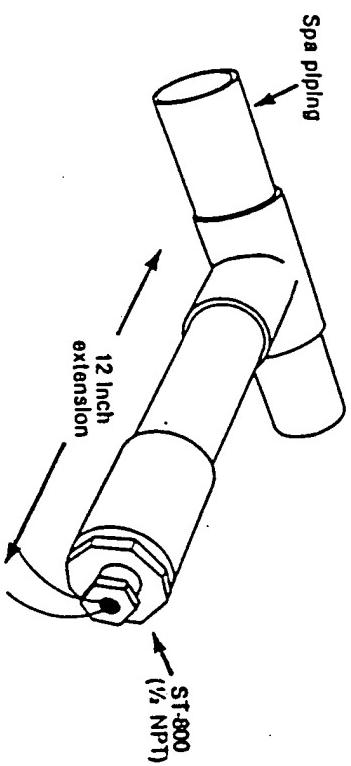
INSTALLATION OF EQUIPMENT CAN:

Attach mounting strap to back of can using two #8 screws supplied. Securely attach can assembly to vertical surface. Route AC and DC wires as shown for maximum isolation.

CAUTION: DO NOT INSTALL EQUIPMENT CAN WITHIN 5 FEET OF SPA.



Select area of plumbing most likely to freeze first — consider "windchill" factors, etc. Install sensor at end of tee extension of pump plumbing as shown:



The 12 inch extension provides a "time delay." Main spa water must mix throughout 12 inch extension before the sensor will turn off. Additionally the extension ensures the ST-800 will sense freezing conditions before the main plumbing begins to freeze.

CAUTION: INSTALL EXTENSION EITHER HORIZONTALLY OR IN DOWNWARD POSITION TO AVOID AIR ENTRAPMENT AROUND SENSOR.

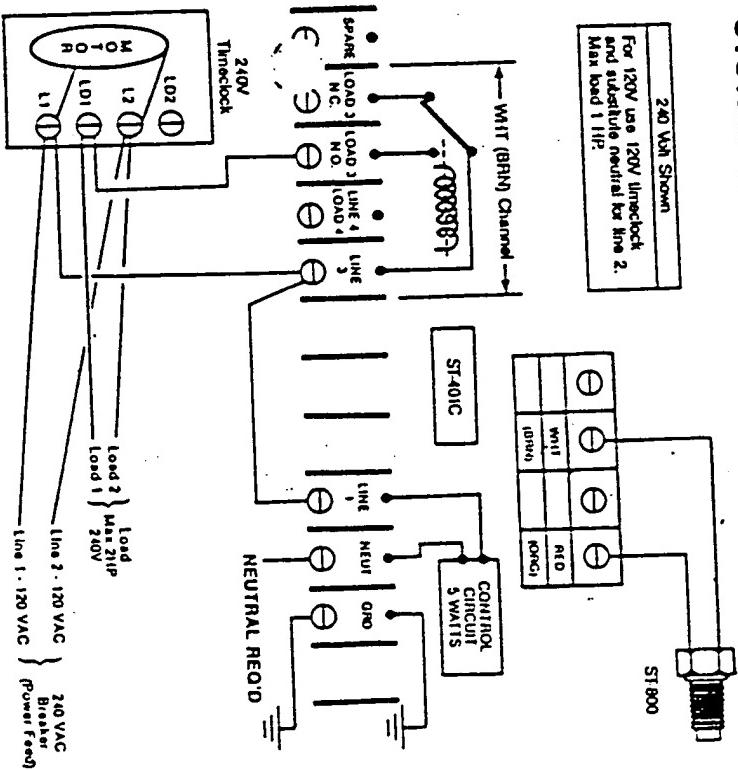
- Minimum 1 inch pipe should be used for extension.
- If in doubt about area most likely to freeze — use multiple ST-800s and wire in parallel so any sensor will turn desired channel ON.
- On two speed pumps, always activate High Speed Channel — low speed has insufficient head pressure to prevent freezing in severely cold climates.

Control Terminals In your ST-401C or ST-402C. Exact wiring instructions are included with each Control Head (001, 400/2, 400/3, 132, 12004).

To Operate	Connect ST-800 Between
White Channel Black Channel	Red & White Terminals Red & Black Terminals

TESTING:
After all wiring has been completed, immerse sensor in ice water before installing sensor into plumbing. Allow several minutes for sensor to activate.

TYPICAL TIMECLOCK BYPASS SYSTEM USING ST-401C:



- HEATING WITH TIMECLOCK — You can heat up your spa in your absence by taking advantage of your timeclock programming. Turn ON/OFF button ON and set THERMOSTAT to desired temperature. When your timeclock turns the pump ON your spa will automatically heat.

CAUTION: Make sure your timeclock is set to stay ON long enough to fully heat up spa such that HEATER is turned OFF at least 10 minutes before timeclock turns OFF. Otherwise heater damage can occur by shutting OFF pump when heater is HOT. This is especially important with gas fired heaters.

- TIMECLOCK FILTRATION WITHOUT HEAT — Keep ON/OFF button OFF. This will de-activate thermostat.

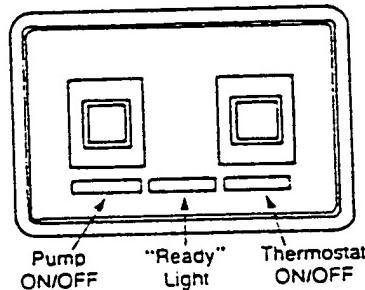
CARE AND MAINTENANCE:

Your Control Center can be cleaned with common non-abrasive household cleaners. Flush with clean water after cleaning. No other maintenance is required.

FREEZE PROTECTION:

If your spa is equipped with the optional Spa-Temp ST-800 FREEZE PROTECTOR, during freezing weather conditions leave your ON/OFF button ON (Jets-Light-Blower OFF) and set THERMOSTAT to LOW or hotter. This will ensure that heat will be added to your spa when ST-800 turns ON your pump.

OPTIONAL IN-HOUSE CONTROL ST-1200/4 IH



Provides in-house convenience in a handsome, compact 2 1/4 X 3 1/2 inch control panel. Easily installed into any wall, nightstand, headboard, etc.

The ST-1200/4 IH allows you to:

- Heat up spa and see when it is ready — only go outside to USE your spa.
- Programs spa to heat up with timeclock — spa can be ready when you come home from work.
- Program spa to automatically add heat in freezing conditions.
- Turn on pump without heat for fast spa cleanup.
- Monitor spa use — lights inside house will illuminate when spa-side panel is turned ON.

Part No. 5012-2002 REV 0

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OPERATION

The ST-800 Freeze Sensor, when wired correctly, turns ON the circulation pump when 40°F water is sensed in the spa plumbing. In severe cold weather, freeze damage can occur even with the spa pump ON if the spa water temperature is allowed to drop near freezing. To prevent this, your heater should be programmed to "fire" when the ST-800 Freeze Sensor turns ON the pump as follows (only required for severe cold weather):

SYSTEMS WITHOUT SPA-TEMP IN-HOUSE CONTROLS — keep main heater switch ON and make sure heater thermostat or Spa-Temp thermostat is set to LOW or hotter.

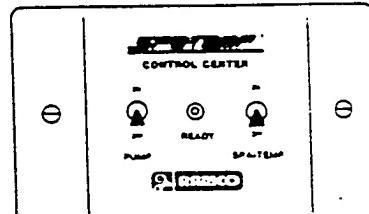
SYSTEMS WITH SPA-TEMP IN-HOUSE CONTROLS — set Spa-Temp thermostat to LOW or hotter and keep in-house Spa-Temp switch ON.

TOTAL SYSTEM FREEZE PROTECTION FOR SEVERE COLD WEATHER

In severe cold weather, freeze damage can also occur in the blower piping, and in the jet pump of a 2 pump spa system. To accomplish total freeze protection of all pumps and blower, the ST-1100 Control Center and the ST-1150 In-House Controls are required (Note: The ST-1150A cannot be used for Total System Freeze Protection). Wire system as shown in the ST-1150 instructions and according to Figure 5 of these instructions.

Program System For Total Freeze Protection As Follows:

1. Turn ON Pump Switch and Spa-Temp switch at In-House control panel.
2. Turn ON Jet Button and Blower Button at spa. Turn temperature to LOW or hotter.
3. Turn OFF Pump Switch in house, leave Spa-Temp Switch ON.



ST-1150 IN-HOUSE REMOTE CONTROL

When programmed in this manner, the ST-800 Freeze Sensor will turn ON your circulation pump, Jet pump (if 2 pump system), heater and blower for short periods of time when danger of freezing is sensed.

NOTE: If your system uses a time clock, the pumps, heater and blower will also turn ON when your time clock turns ON.

SPA-TEMP™

WARRANTY

RAMCO MANUFACTURING, INC. warrants to the original owner its SPA-TEMP ST-800 to be free from defects in material and workmanship for a period of 1 year from the date of purchase.

If found defective, return prepaid with proof of purchase to: Customer Service
RAMCO MFG., INC.
1086 North 11th Street
San Jose, CA 95112

The unit will be repaired or replaced at RAMCO's option.

Field Service Labor is specifically excluded from the terms of this warranty.

Except as set forth above, there shall be no other guarantee, warranty, or liability either expressed, implied or oral or statutory and in no event shall RAMCO MFG., INC., its agents or employees, be liable for injury or damage to any person or property whatsoever, or for any special, indirect, contingent, secondary or consequential damage of any nature however so arising.

Your specific legal rights under the limited warranty may vary from State to State.



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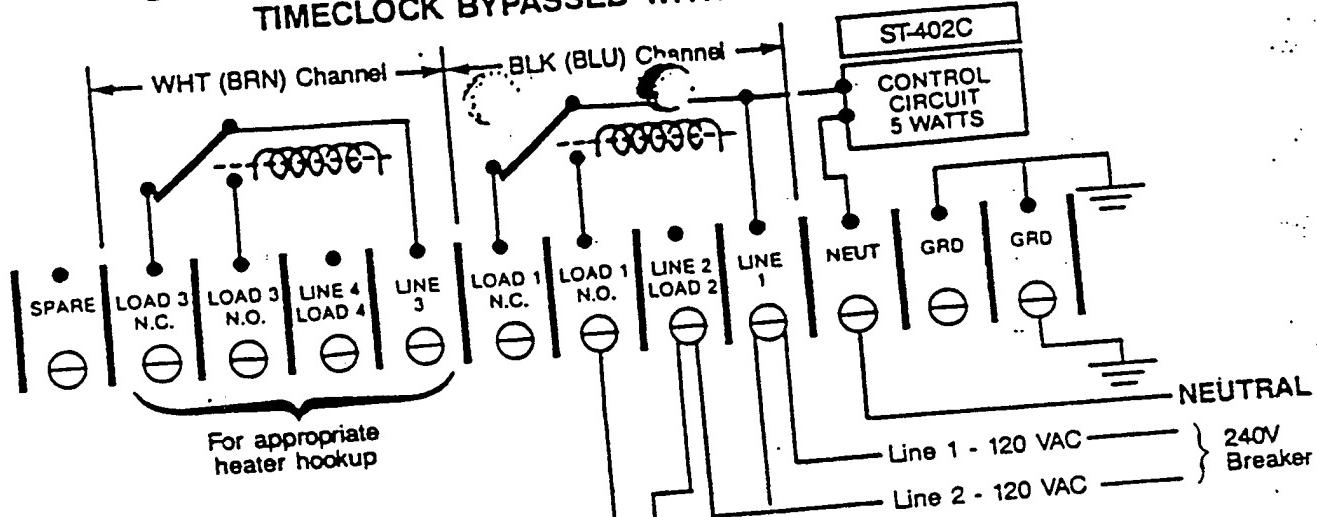


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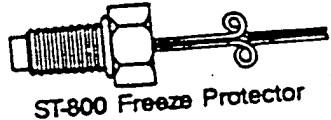
© 1982 RAMCO MFG., INC.

FORM 800/3821

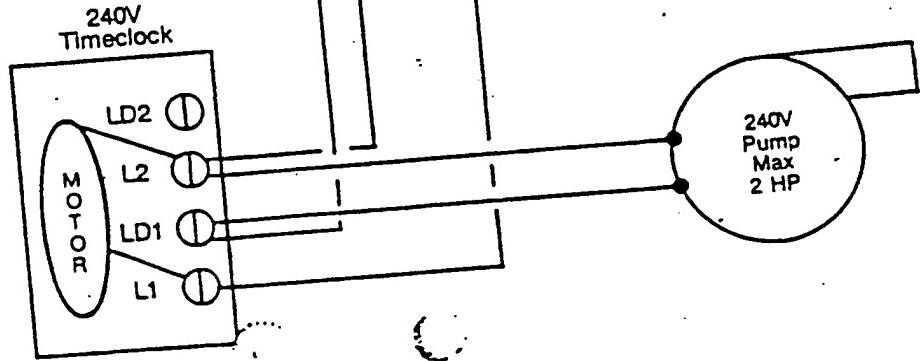
**SINGLE SPEED PUMP — TIMECLOCK CONTROLLED
TIMECLOCK BYPASSED WITH BUTTON**



Adding Freeze Protection



Connect ST-800 between the RED and BLACK ST-402C D.C. Control Limited Energy Terminals. The ST-800 will turn ON the pump at 40°F and OFF at 50°F, just like pushing the ST-132 pushbutton.

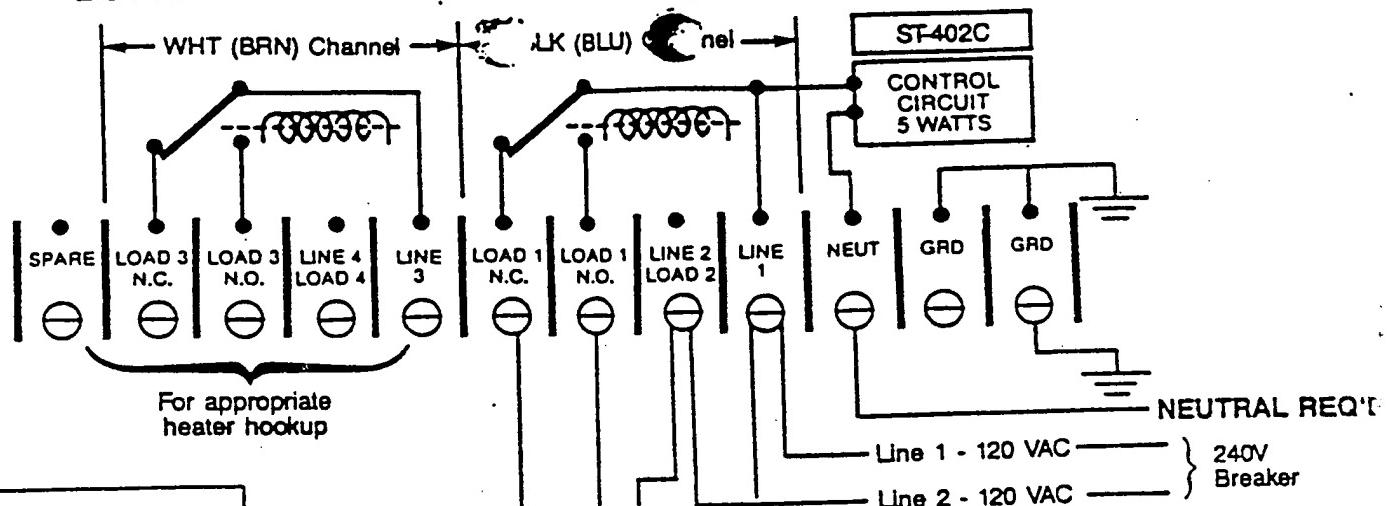


240 Volt Shown

For 120 volt pump use 120 volt timeclock and substitute neutral for line 2. Max load 1 HP.

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**TWO SPEED PUMP
TIMECLOCK CONTROLLED LOW SPEED
BUTTON CONTROLLED HIGH SPEED (BYPASSES TIMECLOCK)**



Connect ST-800 between the RED and BLACK ST-402C D.C. Control Limited Energy Terminals. The ST-800 will turn ON the pump at 40°F and OFF at 50°F, just like pushing the ST-132 pushbutton.

Pickup L1 clock motor wire or clock will stop when bypassed.

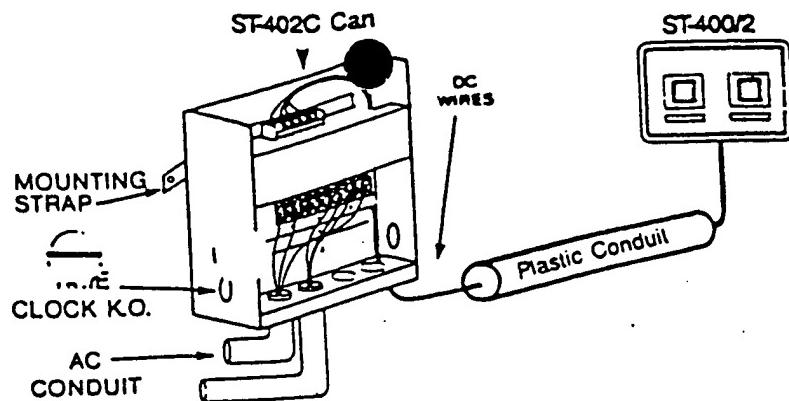
240 Volt Shown

For 120 volt pump use 120 volt timeclock and substitute neutral for line 2. Max load 1 HP.

INSTALLATION OF EQUIPMENT CAN:

Attach mounting strap to back of can using two #8 screws supplied. Securely attach can assembly to vertical surface. Route AC and DC wires shown for maximum isolation.

CAUTION: DO NOT INSTALL EQUIPMENT CAN WITHIN 5 FEET OF SPA.



Pump
Max
2 HP

Line 2 - 120 VAC

ADDING FREEZE PROTECTION

The ST-800 Freeze Protector may be added to either the WHITE (BRN) or BLACK (BLU) channel by connecting it in parallel with the respective ST-400/2 button at the ST-402C DC control terminals:

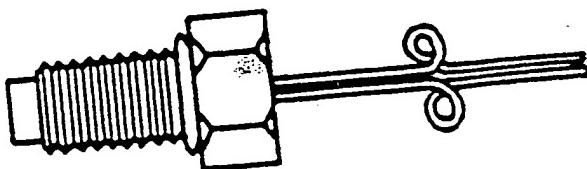
CHANNEL

WHITE (BRN)
BLACK (BLU)

CONNECT ST-800

Between RED and WHITE
Between RED and BLACK

The ST-800 will turn on the chosen channel just like pushing the respective ST-400/2 button. The ST-800 turns on at 40°F and off at 50°F.



ST-800 Freeze Protector

012262

SPECIAL FREEZE PROTECTION INSTRUCTIONS:

- ST-1200/4 ON/OFF button can be used to select HEAT or NO HEAT when used with ST-800 Freeze Protector.
 - ON/OFF - ON: ST-800 Freeze Protector will turn ON pump and heater. Set ST-1200/4 thermostat to *LOW* or higher.
 - ON/OFF - OFF: Heater inactivated — ST-800 Freeze Protector will only turn ON pump.

For a reliable installation, the sensor wire splices must be waterproofed as shown in Figure 3.

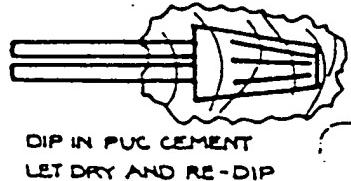
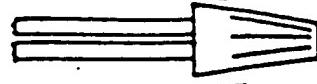
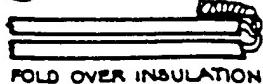
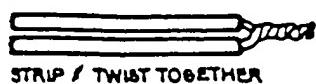


FIGURE 3 — WATERPROOFING 6 VDC WIRE SPLICES

WIRING THE SENSOR

ALL WIRING MUST BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND/OR LOCAL CODES.
Use 22 gage or heavier wire for all sensor wiring.

SINGLE SPEED PUMP WITH ST-1100 CONTROL CENTER

Connect ST-800 leads to RED terminal and BLACK terminal on the D.C. side of the ST-1100 equipment board as shown in Figure 4.
Works with or without ST-1150A In-House Control.

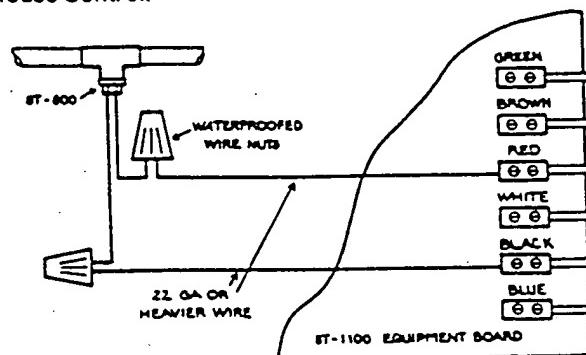


FIGURE 4 — WIRING TO ONE PUMP SINGLE SPEED SYSTEM
WITH ST-1100 CONTROL CENTER

TWO SPEED PUMP OR TWO PUMP SYSTEMS WITH ST-1100 CONTROL CENTER

NOTE: Requires the use of the ST-1150 In-House Remote Control, or ST-600 Interface to bypass time clock.

WITH ST-1150 IN-HOUSE REMOTE CONTROL

Connect the ST-800 leads to the two "REMOTE" 6VDC terminals in the ST-900 Time Clock Bypass (the ST-900 is part of the ST-1150 Remote Control Package)

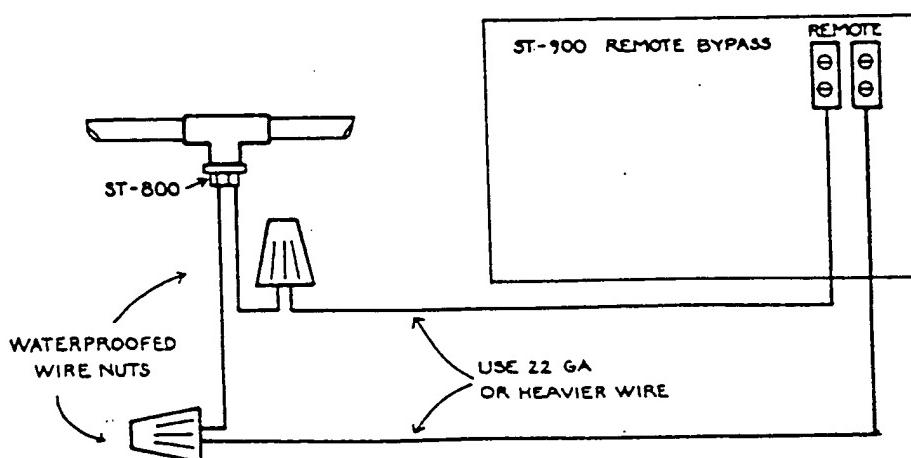


FIGURE 5 — WIRING TO 2 SPEED PUMP OR 2 PUMP SYSTEM WITH ST-1100 CONTROL CENTER
AND ST-1150 IN-HOUSE CONTROLS.

WITH ST-600 ELECTRICAL INTERFACE

Connect the ST-800 leads to the two terminals labeled "SPA-TEMP" as shown in Figure 6. Wire ST-800 as shown to "bypass" time clock.

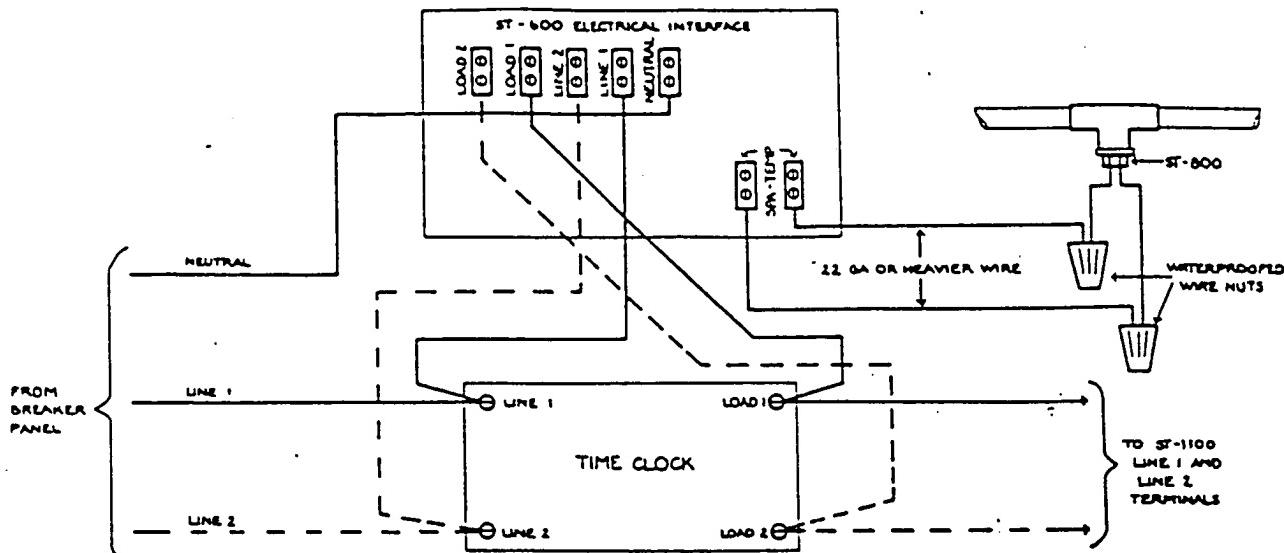


FIGURE 6 — WIRING TO 2 SPEED PUMP OR 2 PUMP SYSTEM WITH ST-1100 CONTROL CENTER AND ST-600 ELECTRICAL INTERFACE.

When wired as shown, the ST-800 will bypass time clock when danger of freezing is sensed, turning on circulation pump.

CAUTION

USE COLOR CODED WIRE FOR TIME CLOCK BYPASS WIRING (LINE 1 — LOAD 1 = RED, LINE 2 — LOAD 2 = BLACK). WIRE EXACTLY AS SHOWN. IF WIRES ARE CROSSED ANYWHERE, A DIRECT SHORT MAY OCCUR, DESTROYING THE ST-600 ELECTRICAL INTERFACE.

PUMPS WITHOUT ST-1100 CONTROL CENTER

Install with an ST-600 Electrical Interface, wiring as shown in Figure 7. The freeze protection A.C. circuit will then be in parallel with the existing A.C. power input circuit to the pump.

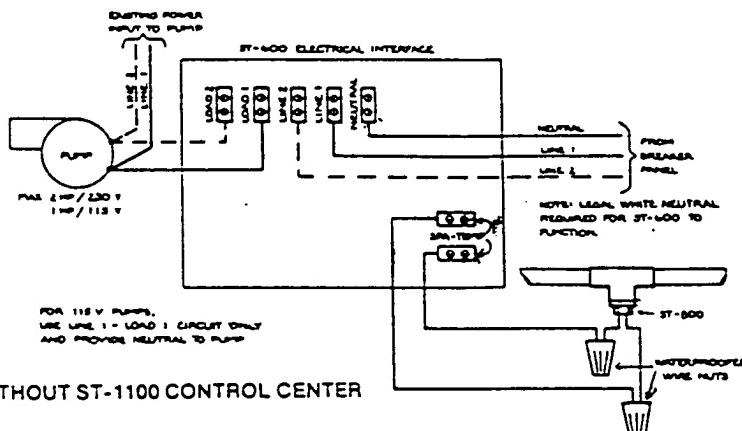


FIGURE 7 — WIRING PUMP WITHOUT ST-1100 CONTROL CENTER

CAUTION

USE COLOR CODED WIRE (RED=LINE 1 — LOAD 1, BLACK=LINE 2 — LOAD 2) AND WIRE EXACTLY AS SHOWN. IF RED AND BLACK WIRES ARE SWITCHED ANYWHERE, A DIRECT 220V SHORT WILL OCCUR WHEN PUMP AND FREEZE PROTECTION ARE BOTH ON. THIS WILL DESTROY THE ST-600 ELECTRICAL INTERFACE.

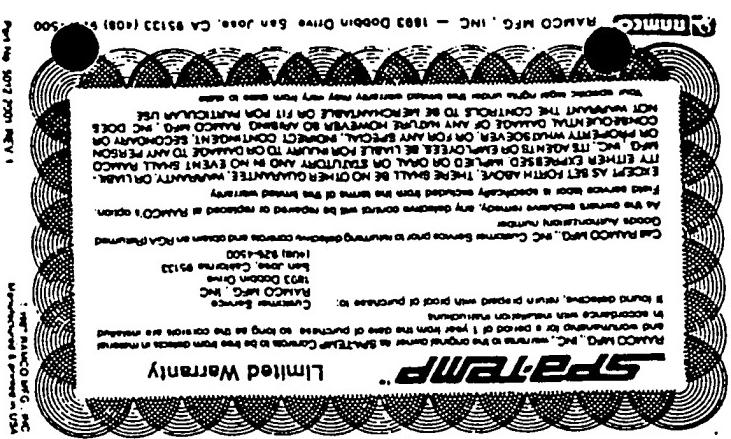
TESTING

The freeze protection circuit may be tested by either of the following methods:

1. Submerge ST-800 Freeze Sensor in ice water until freeze protection circuit turns ON. The ST-800 Sensor will activate the freeze protection circuit at a minimum 40°F and will de-activate circuit at a maximum 50°F.
2. Jumper the two ST-800 Sensor lead wires together, activating the freeze protection circuit.

Note: This method does not test the sensor thermal switch.

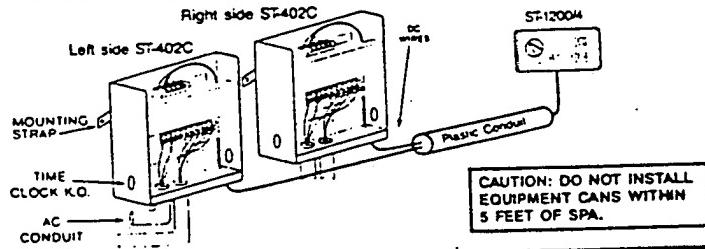
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INSTALLATION NOTES:

INSTALLATION OF EQUIPMENT CANS:

Attach mounting straps to back of cans using two #8 screws supplied. Securely attach cans to vertical surface. Route AC and DC wires as shown for maximum isolation.



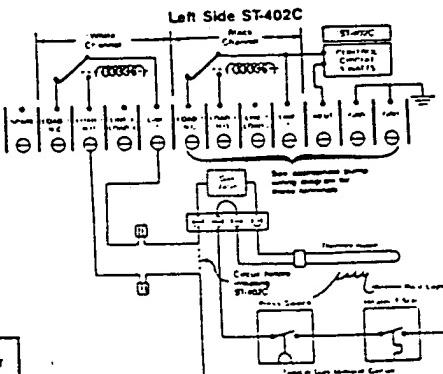
EQUIPMENT WIRING:

The leftside ST-402C WHITE CHANNEL is used for heater hookup. Three installations are shown - millivolt gas, electronic gas, and electric - 6KW and 12KW. Select the correct wiring diagram for your heater and wire accordingly. Next, select the correct pump wiring diagram (single or two speed) and wire accordingly. This will complete your installation of the LEFT SIDE ST-402C. Wire RIGHT SIDE ST-402C for Light (BROWN CHANNEL) and Blower (BLUE CHANNEL) per Blower and Light diagram to complete entire installation.

GAS MILLIVOLT HEATERS

1. Connect ST-402C terminals **IN SERIES** with the heater control circuit as shown, using 18 gauge or heavier wire.
 2. Route wires inside heater AWAY from flame or potential hot metal or malfunction may result.
 3. Turn UP Heater Thermostat to the maximum desired spa temperature. The remote Spa-Temp ST-2004 Thermostats will control the water temperature UP TO the setting of the heater thermostat, and **WILL NOT** override the heater thermostat.

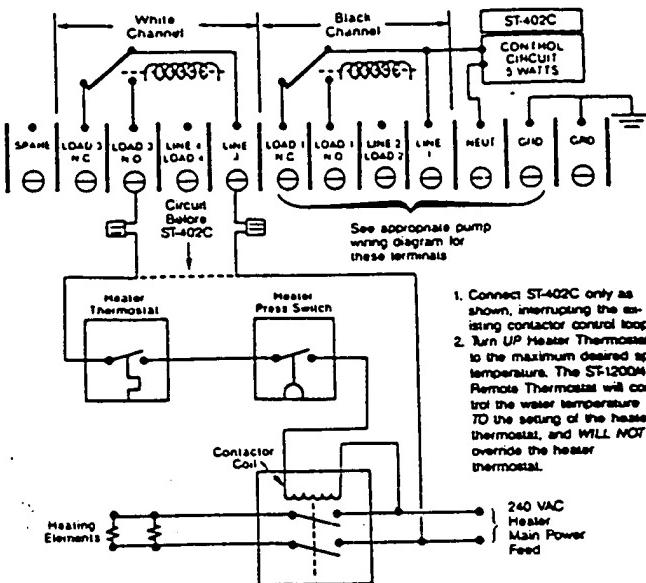
**CAUTION: DO NOT BYPASS OR DISABLE THE
HEATER PRESSURE SWITCH OR THERMOSTAT.
OR DAMAGE (FIRE) MAY OCCUR.**



ELECTRIC HEATERS
240V — 8KW and 12KW

CAUTION: DO NOT ROUTE MAIN HEATER LINE POWER THROUGH ST-402C TERMINALS OR YOU MAY DAMAGE THE ST-402C

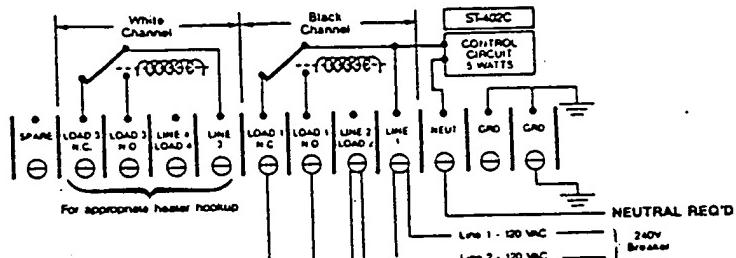
Left Side ST-402C



1. Connect ST-402C only as shown, interrupting the existing contactor control loop.
2. Turn UP Heater Thermostat to the maximum desired spa temperature. The ST-12004 Remote Thermostat will control the water temperature UP TO the setting of the heater thermostat, and WILL NOT override the heater thermostat.

**TWO SPEED PUMP
TIMECLOCK CONTROLLED LOW SPEED
BUTTON CONTROLLED HIGH SPEED (BYPASSES TIME CLOCK)**

Left Side ST-402C

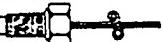


Pick up L1 timerclock motor wire — otherwise
clock motor will stop when timerclock is bypassed.

240 Volt Shown

For 120 volt pump use 120 volt
timerclock and substitute neutral
for line 2. Max load 1 HP.

Adding Freeze Protection


ST-800 Freeze Protector
Connect ST-800 between the
RED and BLACK ST-402C DC
Control Limited Energy Ter-
minals. The ST-800 will turn
ON the pump at 40°F and OFF
at 50°F, just like pushing the
respective ST-12004 push-
button.

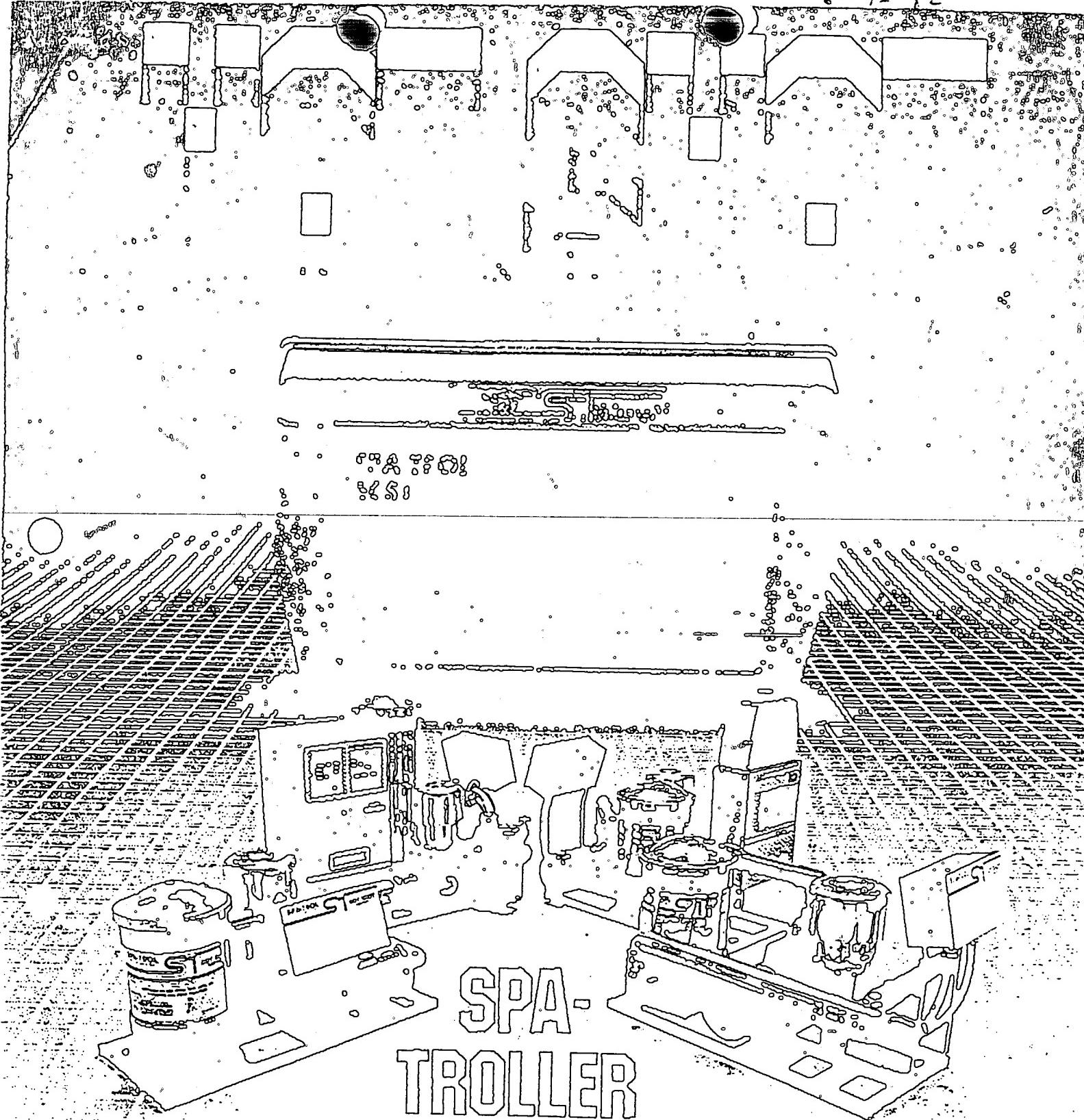
SPECIAL FREEZE PROTECTION INSTRUCTIONS:

The ST-12004 ON/OFF button can be used to select HEAT or NO HEAT when used with ST-800 Freeze Protector:

ON/OFF - ON: ST-800 Freeze Protector will turn ON pump and heater. Set ST-12004 ther-
mostat to LOW or higher.

ON/OFF - OFF: Heater inactivated — ST-800 Freeze Protector will only turn ON pump.

012267

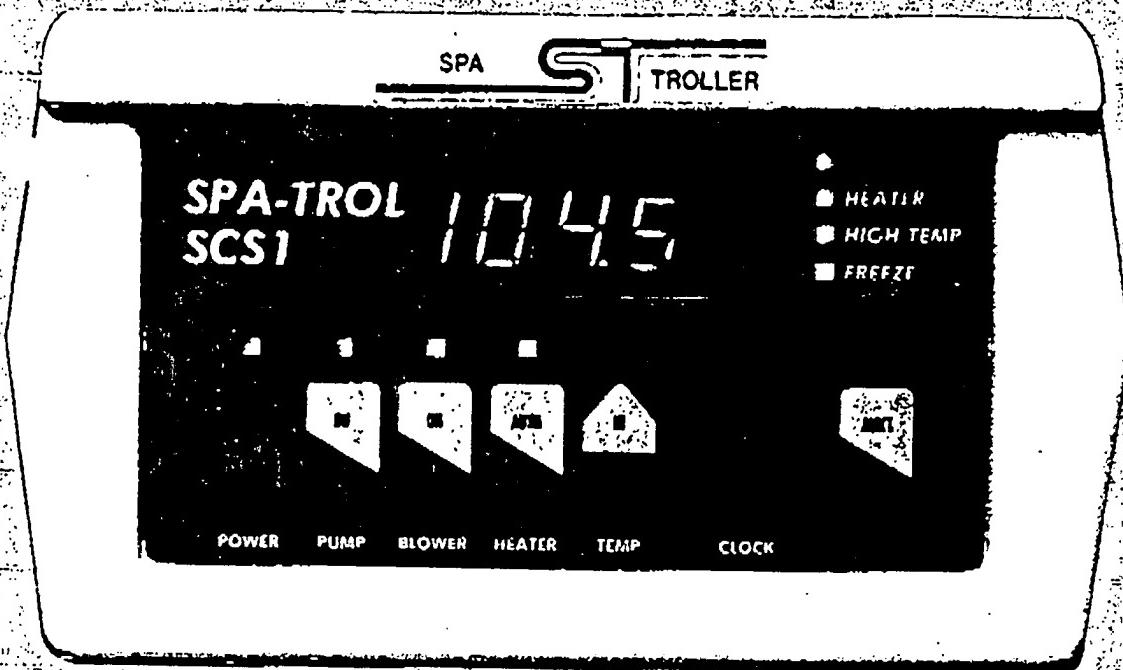


THE COMPUTERIZED SYSTEM

Alt: 6/3/82

Brabot: Colenbach?

COMPLETE PROGRAMMING AND CONTROL FROM ONE CENTRAL COMPUTER



110V

Featuring the
Available: 220V
With Larger F1
Equalizer

THE COMPUTERIZED SYSTEM

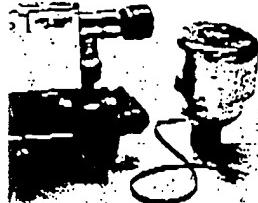
Imagine controlling all the functions of your spa from one central computer. A computer that activates any or all the functions of your spa when you desire.

Introducing Spa-Troller. A self-contained, micro-processing controller that is the heart and brains of our equipment packages. From the control panel of your Spa-Troller, you can control the operation of the jet pump and blower, read the time of day, check the present water temperature of your spa, adjust the desired temperature, and set the time of day that you wish the spa to filter and heat. You can also control up to two more functions such as a spa light, music, etc. Spa-Troller also has built in protection to prevent the water in your spa from freezing should the outside temperature become too cold.

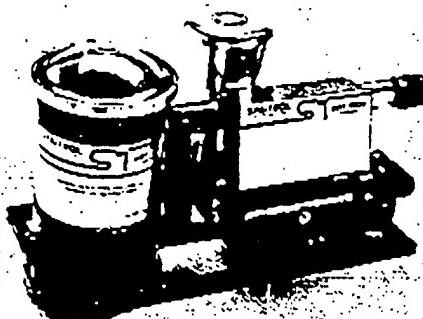
All the controls are self explanatory. The buttons are touch sensitive and when firmly depressed with the tip of the finger, an electric buzzer sounds and at the same time the corresponding function light lights up to indicate that it has been activated. What could be simpler or more convenient?

The Spa-Troller is now incorporated into all our models to further enhance and simplify the control of your spa. Among the other unique features of our equipment are: (1) The under-the-skirt gas heater, (2) Equalizer filter, (3) Copper heater housing, (4) Polished aluminum blower housing to insure rapid dissipation of heat, (5) Large digital read-out, (6) Indicator light if your spa is over-heated, (7) Gas heater that uses only $\frac{1}{2}$ in. gas line such as a bar-b-que or fireplace, and (8) Complete control from the spa for your convenience.

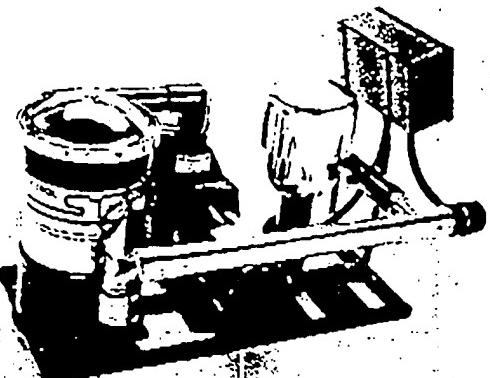




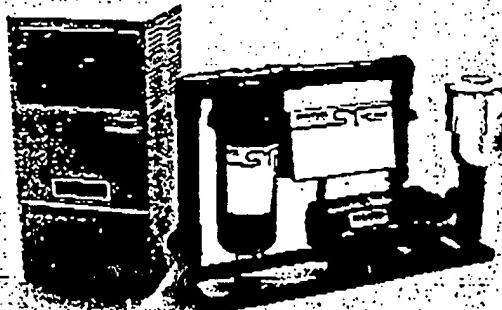
EM CUSTOMS
With Spa-Troller



110 STANDARD
With Spa-Troller and
The Equalizer Filter



6KW or 11KW, 220V
With Spa-Troller and
The Equalizer Filter



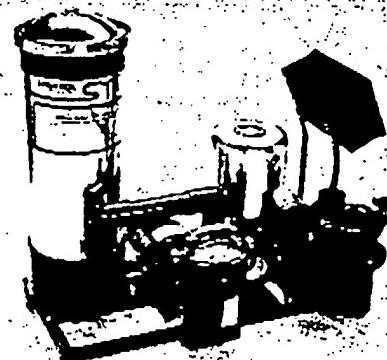
**OEM 110V UNDERSKIRT GAS
PACK** For Those Who Want The
Ultimate Efficiency, Economy and
Technology



SUPER DUPER GAS
With Power & Performance to
Satisfy the Most Discriminating



DD-A-HEATER
Single Pump

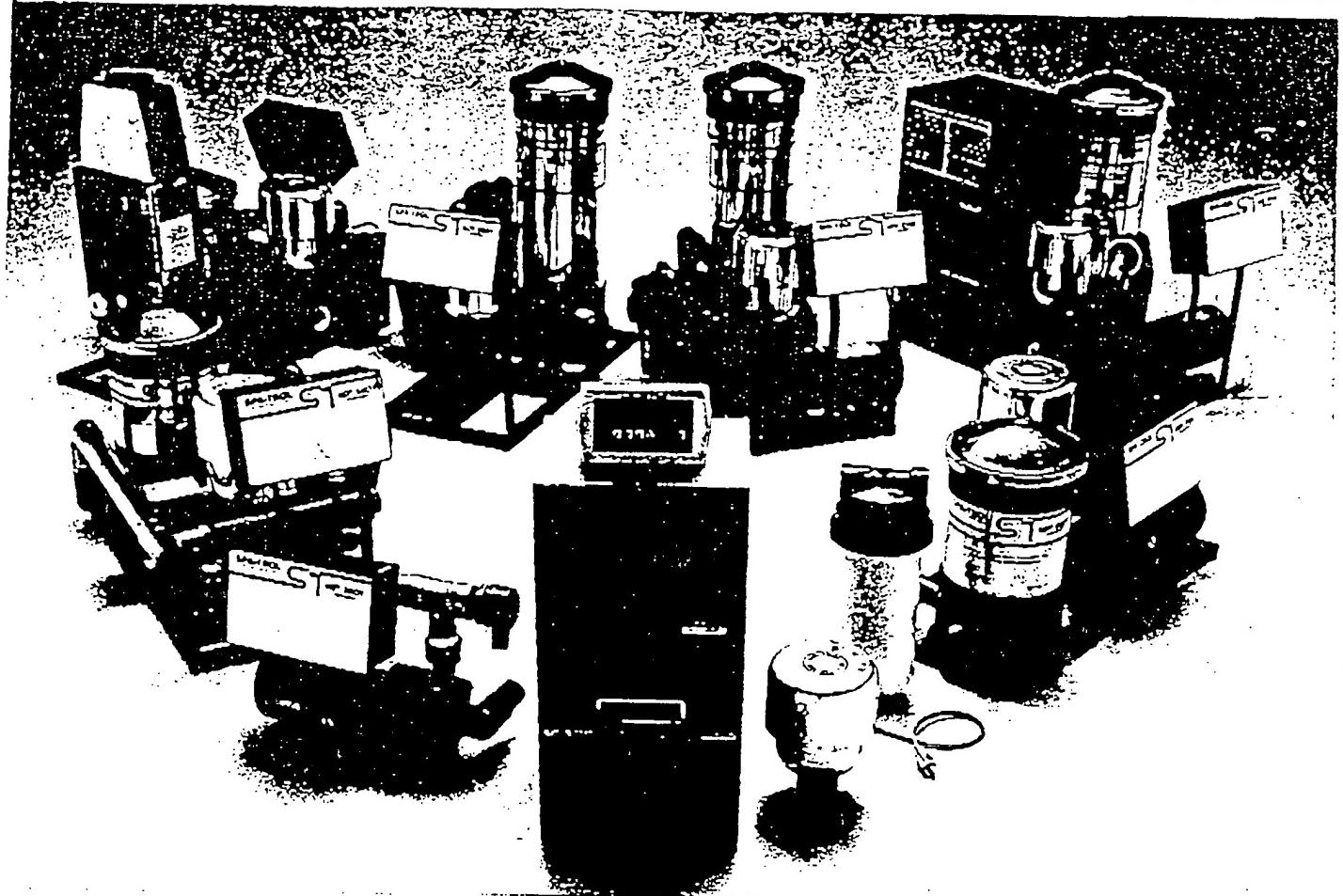


ADD-A-HEATER
Double Pump with Shot Gun Action



OPTIONS
Various Pumps, Blowers, Filters
are Available. Please Check with
Factory Representative.

SPA-TROL



SPECIFICATIONS	OEM Customs	110 OEM	110 Standard	6 KW	11 KW	Condo Gas Pack	Super Gas	Under Skin OEM Gas	Super Duper Gas (Box)	Condo With Booster	Add-a-Heater 1 Pump	Add-a-Heater 2 Pump
	% HP 2 sp	% HP 2 sp	% HP 2 sp	% HP 2 sp	1 HP 2 sp	% HP 1 sp	1 HP*	% HP 1 sp	1 1/2 HP* 1 SD	1 1/2 HP 1 sp	1 HP* 1 SD	1 1/2 HP* 1 SD
Jet Pump	% HP 2 sp	% HP 2 sp	% HP 2 sp	% HP 2 sp	1 HP 2 sp	% HP 1 sp	1 HP*	% HP 1 sp	1 1/2 HP* 1 SD	1 1/2 HP 1 sp	1 HP* 1 SD	1 1/2 HP* 1 SD
Circulating Pump	% HP	NA	NA	NA	NA	% HP	NA	% HP				
Equalizer Filter	All	12.5 Sq. Ft.	25 Sq. Ft.	25 Sq. Ft.	25 Sq. Ft.	25 Sq. Ft.	50 Sq. Ft.	12.5 Sq. Ft.	50 Sq. Ft.	25 Sq. Ft.	50 Sq. Ft.	50 Sq. Ft.
Blower	All	6 Amp	6 Amp	1 1/2 HP	1 1/2 HP	1 1/2 HP	1 1/2 HP	1 1/2 HP	1 1/2 HP	1 1/2 HP	1 1/2 HP	1 1/2 HP
Power	110V	110V	110V	220V	220V	110V	220V	110V	220V	220V	220V	220V
Time Clock	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Switches	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GFI	Yes	Yes	Yes	NA	NA	Optional	NA	Yes	NA	NA	NA	NA
Freeze Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Heater	1.5 KW	1.5 KW	1.5 KW	6 KW	11 KW	38,000 BTU	38,000 BTU	40,000 BTU, Forced Draft	40,000 BTU, Forced Draft	38,000 BTU	NA	NA

*Filter & pump size may vary at dealer

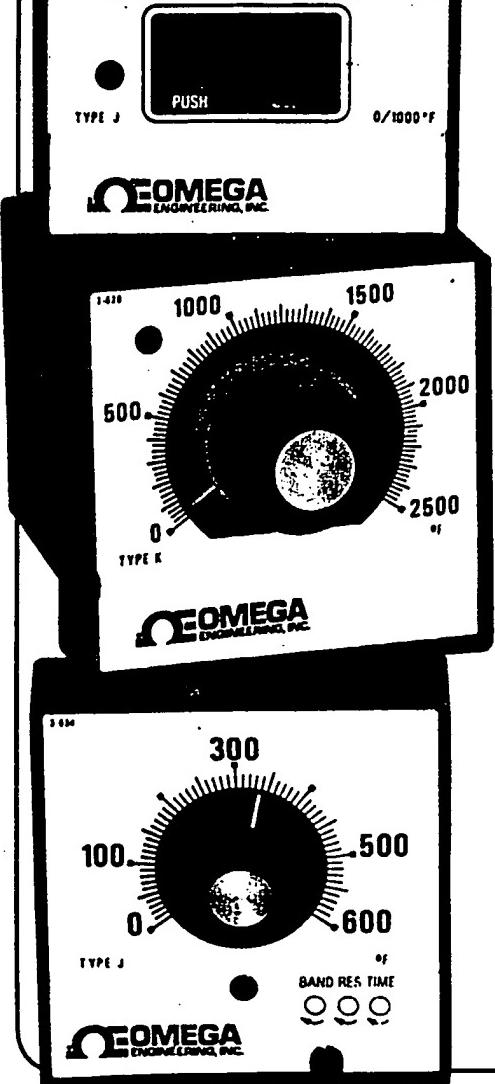
Due to continual product improvement we reserve the right to change materials and specifications at any time without notice or obligation.

Distributed by:

SPA-TROL



871-B W. 15th St. Newport Beach
California 92663
(714) 646-9664



SPECIFICATIONS

Panel Cutout: 3 $\frac{3}{8}$ " (92 mm) sq. per DIN-43700

INPUTS

Thermocouples: Types J, K, T cold junction compensation.

- Standard upscale break protection, field convertible to downscale
- Lead Resistance: 1°F shift per 100 ohms.
- Interchangeability: range chips permit interchange of any standard analog thermocouple range.

MODES/SIGNAL FORMS

Time Proportioning to On/Off:

- Cycle time: adjustable approximately 2-36 sec.
- Bandwidth: adjustable 0-10% of span, with set point in the center.
- Manual Reset: adjustable $\pm 12\%$ of span
- Field convertible to on-off mode with differential approximately .25% of span, symmetrical around set point.

Burst Proportioning:

- Same as time proportioning except cycle time adjustable approximately 0.2 to 3.6 sec. (Not for use with 10 amp relay.)

PID:

- Proportional-Integral-Derivative (3 modes).
- Internal jumpers allow selection of integral between 0 and .4 repeats per minute and derivative between 0 and 3 cycles per second.
- 4-20 mA (Isolated):
 - 20 mA at lower end of proportional bandwidth, approximately 12 mA at set point, 4 mA at upper end of bandwidth. Bandwidth adjustable 0 to 6% of range span with set point in the

center. Isolated optically and by transformer.

SWITCHING DEVICES

10 amp Mechanical Relay:

- Plug-in for easy replacement.
- Rated 10 amp @ 115V ac resistive, 5 amp at 240V ac resistive. SPDT.

1.5 amp Solid State Relay (SPST):

- Rated 1.5 amps @ 130°F ambient temperature, resistive or inductive, 24 to 230V ac.

- Surge current 30 amps for one cycle. Typical off-state leakage current 6 mA, @ 230V ac.

- Zero crossing, optically isolated.

15 amp Solid State Relay (SPST):

- Rated 15 amps @ 130°F ambient temperature, resistive or inductive 24 to 230V ac.

- Surge current 200 amps for one cycle. Typical off-state leakage current 6 mA, @ 230V ac.

- Zero crossing, optically isolated.
- Plugs into controller back and increases depth 1 $\frac{1}{8}$ ".

High or Low Limit Modes with Reset Switch (10 amp mechanical relay required.)

- Available with primary or secondary outputs.

- Lock out on rising (falling) temperature.

- Manual reset switch.

Output Inversion

- For cooling applications.

- Available with solid state or mechanical relay.

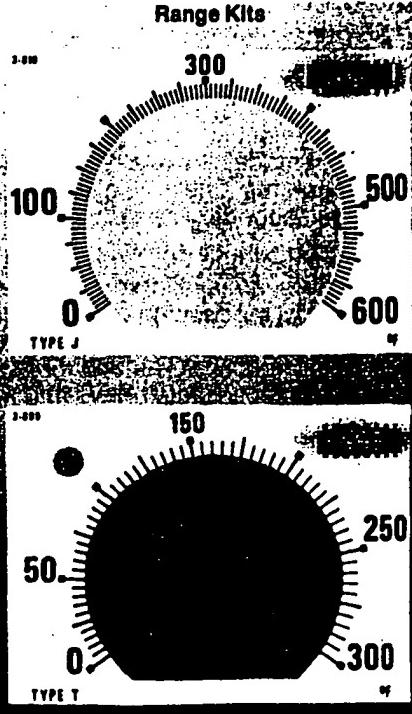
- Failsafe control during power failure.

Nontracking Second Output

- Independent of primary set point.
- Adjustable over 100% of span.

PLUG-IN FIELD KITS

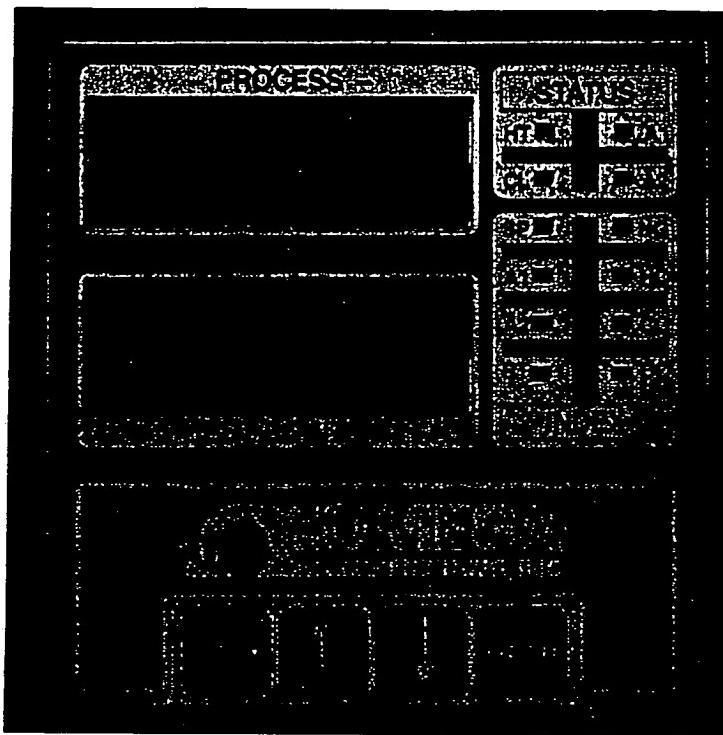
	List Price
KIT #62150-1 Mounting bracket	\$15
KIT #62150-2 4-20 mA isolated (Model I921)	\$100
KIT #62150-4 1.5 amp solid state relay, 24-230 V ac, zero crossing	\$60
KIT #62150-5 15 amp solid state relay for plug-in to back of enclosure	\$115
KIT #62150-6 Burst proportioning .2 to 3.6 sec. cycle time	\$40
KIT #62150-7 Automatic Reset/Integral and Derivative (PID) Replacement Part 62138-61	\$65
Standard 10 amp electro-mech-relay	\$15
KIT #62150-8 0-24 V dc switched output	\$25



MICROPROCESSOR BASED TEMPERATURE CONTROLLER

Model 6000

- Heating and Cooling Outputs
- Dual 4-Digit Display
- Dual Process or Deviation Alarms
- Easy Touch-key Setup
- Compact— $\frac{1}{4}$ DIN Case
- Only $3\frac{5}{8}$ " Deep



The Model 6000 Microprocessor-Based Controller provides the latest in heating and cooling control. A large dual 4-digit display shows process and set point temperatures at a glance. Three mode (proportional, integral and derivative) action eliminates offset as cooling and heating requirements change.

Touch-key setup eliminates all external knobs and protruding switches. Parameters are entered easily and can be locked in to prevent unauthorized tampering.

Heating and cooling outputs can be either relay, 4-20 mA, Triac or 20 V dc pulsed, in any combination.

Available with thermocouple types J, K or T, or RTD inputs, and ranges up to 2500°F (1370°C).

**Thermocouple
Model 6001**
*Single Set Point
Single Output
(Heat Only)*

From
\$446

**Thermocouple
Model 6002**
*Single Set Point
Dual Outputs
(Heat/Cool)*

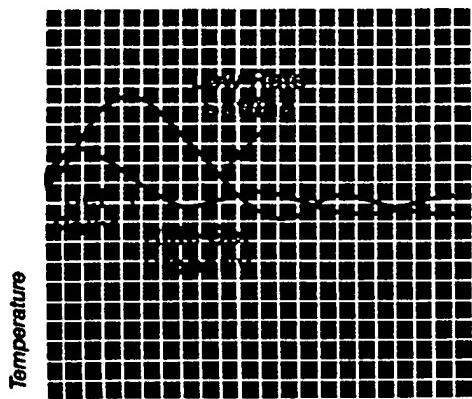
From
\$483

Micropcessor Based Temperature Controller Model 6000



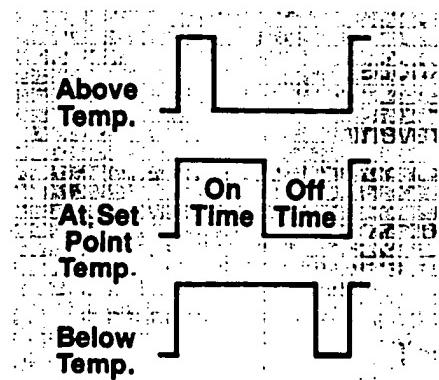
RATE WITH AUTOMATIC RESET

The rate function provides the controller with the ability to compensate for rapid changes in temperature. This function senses the rate of change, and applies immediate corrective action. Automatic reset, which tracks the rate, is used to eliminate offset (the difference between the set point and the stable process temperature). Using an integrator circuit, reset shifts the proportional band of the controller to correct for offset.



HEATING AND COOLING CYCLE TIMES

Adjustment of the cycle times for both the heater and cooler are required to match the controller to the process. Cycle times should be set to the longest possible, depending on the process, for increased relay life. For the heater, the amount of power applied is increased below set point, and decreased above set point. For the cooler, the amount of power applied is decreased below set point, and increased above set point.



PID CONTROL

OMEGA's unique Model 6000 microprocessor based controller was developed to satisfy the need of actual end users. Three mode (Proportional, Integral and Derivative) action eliminates offset (droop) as cooling and heating requirements change in the process and provides fast output response to rate of change and reduces temperature overshoot and undershoot.

The precision of the set point control is especially valuable because it produces more efficient operation, reduced reject rates and increased product quality.

TOUCH-KEY SETUP

All controls, parameters and function selections are entered at the touch of a key. All external knobs and switches have been eliminated. The completely digital controls can be indexed by touching one button, values can be adjusted at another touch and another touch enters the value. Once values are entered, they can be locked in with an internal switch to prevent unauthorized tampering.

THERMOCOUPLE LINEARIZATION

To assure accurate tracking between the display and the thermocouple, a precision program to linearize signal input from the thermocouple is programmed in the microprocessor. Linearization allows for more precise control and full use of the controllers range.

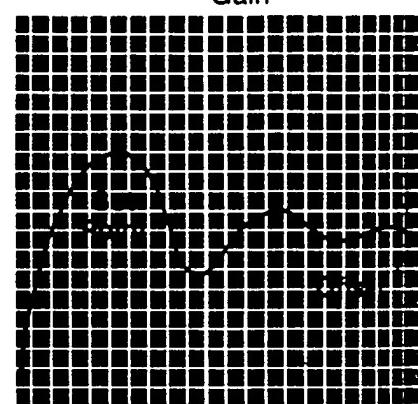
Dual Indication

Now you can compare process temperature and set point at a glance—hands free. The dual digital display concept has formerly only been available in high priced multifunction process controls.

HEAT AND COOL GAINS

Gains set the controller for proportional control of the heating and cooling actions. Gain is the change control action required for a change in the process temperature. It is usually expressed in terms of the proportional bandwidth. Within the proportional band, the controller cycles on and off to control the process temperature. Below the band, heating action is at 100% (always on), and cooling action is at 0% (always off). Above the band, the heater is always off, and the cooler always on.

Bandwidth (in degrees) =
$$\frac{\text{Full Scale Span (in degrees)}}{\text{Gain}}$$



PROCESS OR DEVIATION ALARMS

The process alarm will trip when the temperature is greater than the set point when configured as a high alarm.

It will trip when less than the setpoint when configured as a low alarm.

The deviation alarm will trip when the alarm setting is added (high) or subtracted (low) to the set point.

Process Alarm High



Process Alarm Low



Microprocessor-Based Process Controllers

WARRA

2 YE

WARRA

CN4400 Series
1/16 DIN Size

\$190

Page P-34

OF

CN4500 Series
1/8 DIN Size

\$300

From
Page P-35

OF

2 YEAR

WARRANTY

ple, RTD
tage or
it

Driver, etc.
tput
portionals
e PID
the CN4400 is available with mechanical relay,
SSR driver or 4-20 mA output. For fast hook-up,
the CN4400 features a removable socket mount
design with screw terminals.

' Panel

> Power
heater A

CN4400 Series

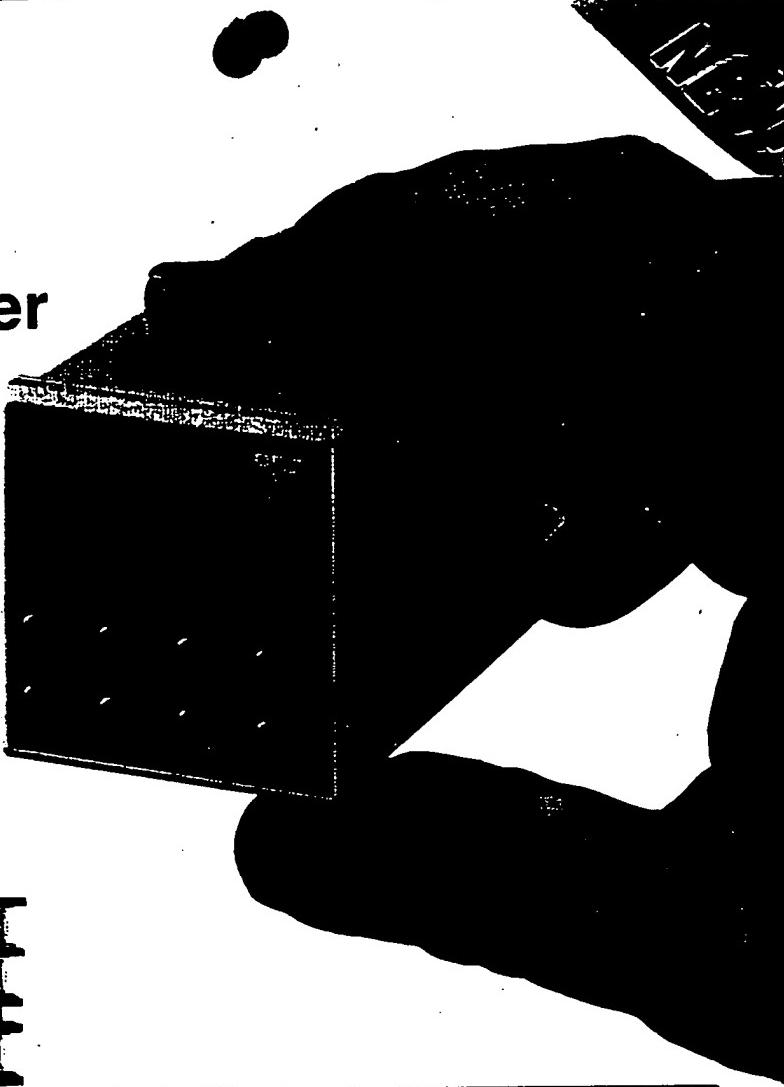
\$190

Included Mount for Units with
Alarms. Replacement model,
CN4401-ASKT, \$10.

Included Socket for Units without Alarms. Replacement
model, CN4401-SKT, \$10.

Input Types and Ranges - All CN4000 Units

Code	Type	Range F	Range C
TR	J	32 to 1832	0 to 1000
	K	32 to 2192	0 to 1200
	T	-328 to 752	-200 to 400
	E	32 to 1472	0 to 800
	R	32 to 2912	0 to 1600
	S	32 to 2912	0 to 1600
	B	32 to 3212	0 to 1800
	RTD	-238 to 752	-150 to 400
CV	V	1 to 5 Vdc	
	mA	4 to 20 mA dc	



To Order (Specify Model Number)

Model No.	Price	Description
CN4401TR	\$190	Thermocouple or RTD input
CN4401CV	190	1-5 Vdc/4-20 mA input

Each unit includes mounting socket.

Output Types and Options

Ordering Suffix	Add'l Price	Description
(std)	N/C	Standard Mechanical Relay Output, 3 A (SPDT)
-D	\$25	Optional SSR Driver Output, 24 Vdc
-F	N/C	Optional 4-20 mA Output
-A	25	Optional single 1 A (SPST) Alarm Relay

Output Types - All CN4000 Units

Type	Description
Mechanical Relay	SPDT, Rated 3 A @ 220 Vac
SSR Driver	24 Vdc Pulse
Current	4-20 mA dc < 600Ω load resistance

al Size

CO

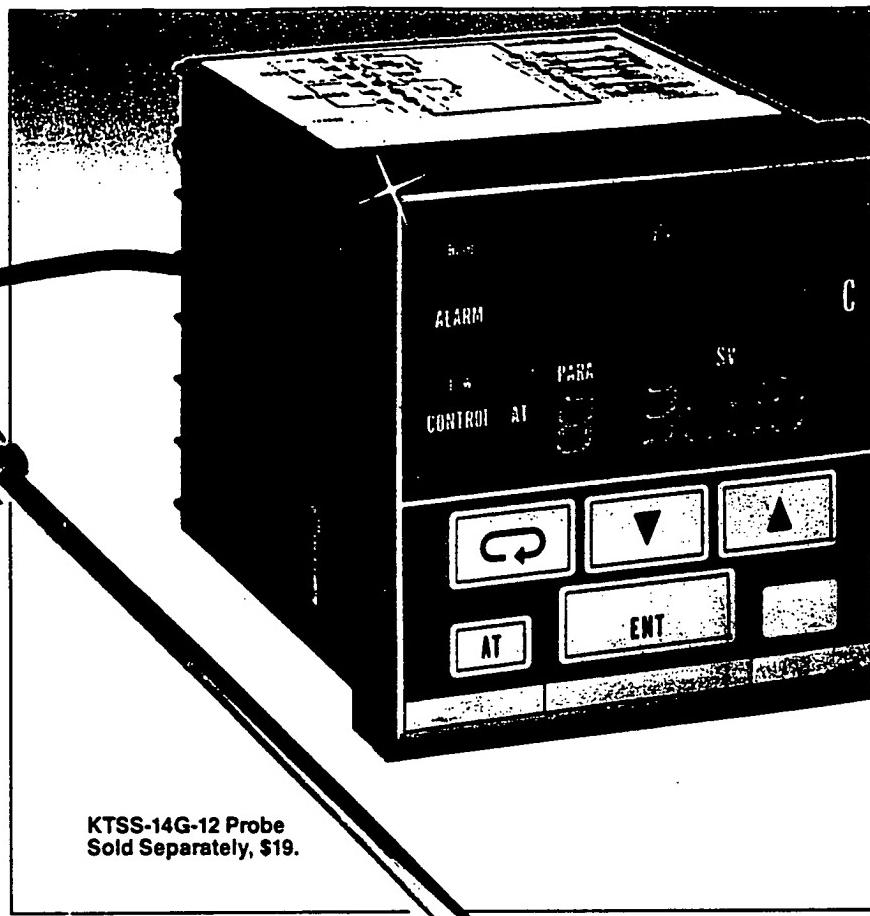
Temperature PID Controller

Auto and Manual Tuning

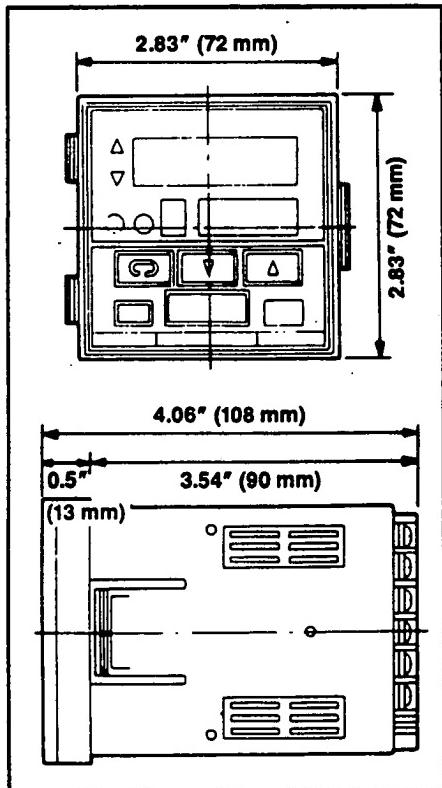
- ✓ Thermocouple, RTD, Voltage and Current Input Models
- ✓ Relay, SSR Driver, Voltage or Current Output Models
- ✓ Automatic or Manual Tuning on Demand
- ✓ Compact Size with 2.7" Square Cutout
- ✓ Optional Alarms Selectable for Process/Deviation Action
- ✓ Isolation of Inputs and Outputs

CN380 Series
\$299

For Best Results with Auto-Tuning, Setpoint Should be at Least 100° Over Ambient Temperature



KTSS-14G-12 Probe
Sold Separately, \$19.



The CN380 temperature and process controllers are available for thermocouple, RTD, voltage or current input. Thermocouple and RTD input models allow the user to select from 11 thermocouple types, or 2 RTD curves. Voltage and current input models allow user-programmable scaling within the -1999 to 7999 count range; the minimum span is 100 counts, while the max. is 5000 counts.

The CN380 features PID auto-tuning for automatic selection of the optimum PID values, or manual setting of the PID parameters. The CN380 is available with either mechanical relay, dc SSR driver, proportional voltage or current outputs. Relay and SSR driver output models can also provide on/off control, if desired.

The optional alarm package offers two alarm points that can be set to any values within the sensor range. These setpoints can be set to absolute or deviation alarms.

Program features also include a keylock for preventing tampering.

To Order (Specify Model)		
Model No.	Price	Output Type
CN381(*)	\$299	mechanical
CN382(*)	299	SSR driver
CN383(*)	299	4-20 mA cur.
CN384(*)	299	0-10 Vdc Vol.

Specify Input type:
 TC — Thermocouple
 RTD — Pt RTD, 3-wire, 100 ohm
 MV — voltage to 50 mVdc
 V — voltage to 5 Vdc
 MA — current to 20 mA

Options

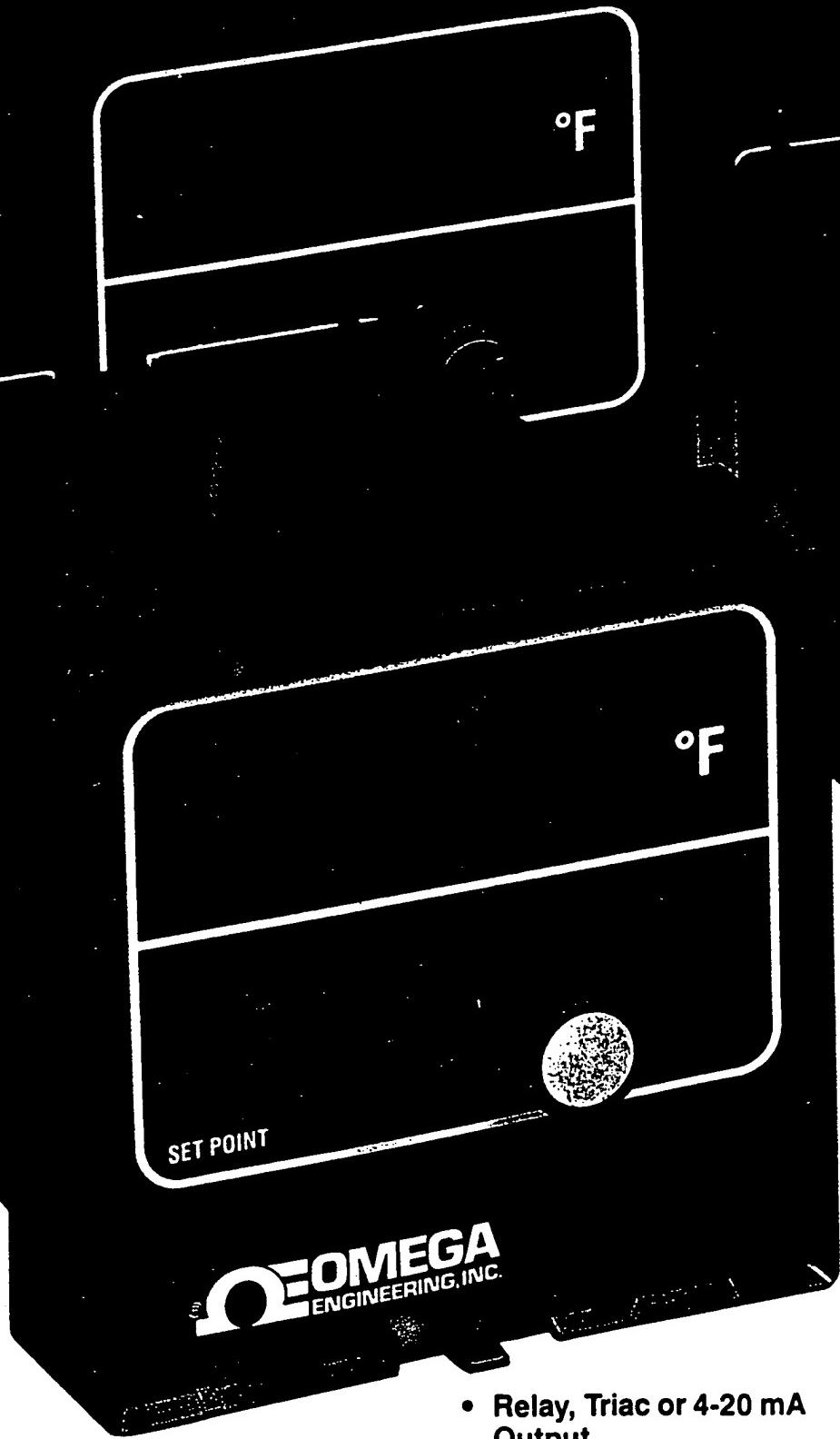
Ordering Suffix	Add'l Cost	Description
-A	\$50	Dual Alarm

Ordering Example: CN381TC-A, \$349. CN380 controller, with thermocouple input and mechanical relay output, and dual alarm.

Digital Temperature Controllers

CN5000 Series

USA



- J, K, T or E Thermocouples
- $\pm 0.5\%$ Full Scale Accuracy
- 1° Resolution
- On-off or Proportional Control
- Single or Dual Setpoint
- PID Control Available
- Relay, Triac or 4-20 mA Output

Input Type	Range	No. of Outputs	Model Number	Price
J Iron Constantan	0 to 650°C	Single	CN5001J1	\$295
		Dual	CN5002J1	345
	0 to 1000°F	Single	CN5001J2	295
		Dual	CN5002J2	345
K Chromel Alumel	0 to 2000°F	Single	CN5001K1	345
	0 to 1000°C	Single	CN5001K2	295
		Dual	CN5002K2	345
	0 to 1000°F	Single	CN5001K3	295
T Copper Constantan	0 to 350°C	Single	CN5001T1	295
		Dual	CN5002T1	345
	0 to 650°F	Single	CN5001T2	295
		Dual	CN5002T2	345
E Chromel Constantan	-85 to 350°C	Single	CN5001T3	295
		Dual	CN5002T3	345
	0 to 650°C	Single	CN5001E1	295
		Dual	CN5002E1	345
	0 to 1000°F	Single	CN5001E2	295
		Dual	CN5002E2	345

IN STOCK FOR FAST DELIVERY



From

\$285

1/4 DIN Cutout
Shown smaller than
actual size

The OMEGA® CN5000 Series Digital Controllers are designed for maximum versatility at an economical price. These units have standard features including a 10 amp mechanical relay with either proportional or on/off control, an easy-to-read LED display, push-to-engage setpoint knob, and LED indication of output status. J, K, T or E thermocouple types may be used as input, with either Celsius or Fahrenheit display.

The modular design of these controllers enables them to be used in various applications. These optional control modes and outputs are also available as field installable kits. Various output types include solid state relay and 420 mA proportional current. PID control is also available, with either relay or current output.

Model CN5001 Single Setpoint Proportional and On-Off Controller

\$295



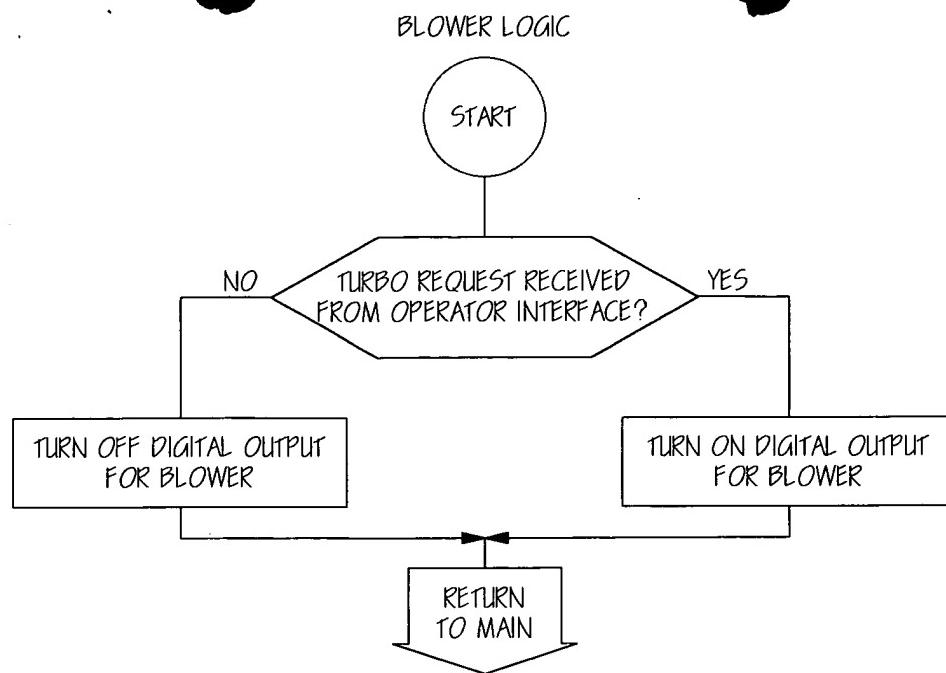
This versatile digital controller can be operated as either a proportional or on-off controller. Set the adjustable bandwidth at up to 10% of full scale and it's a proportional controller. Or, with the bandwidth set to 0, on-off control with a 0.25% of span differential is possible. To read and adjust the setpoint, simply depress the push-to-set knob, and turn it to the desired setpoint.

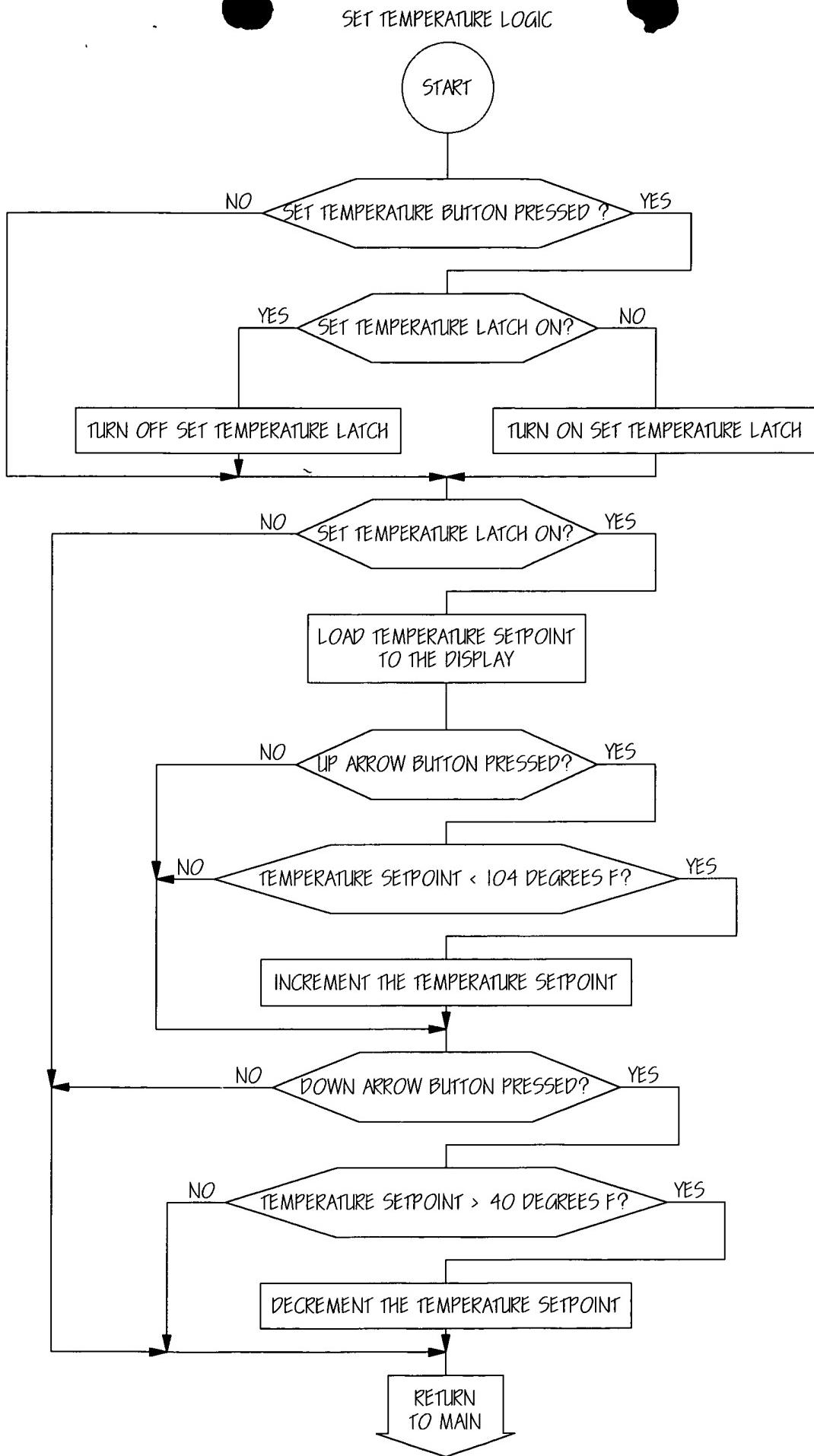
The standard CN5001 is available with either J, K, T or E thermocouple types, and has a 10 A mechanical relay. Available options include solid state relays or proportional current outputs, and PID (proportional-integral-derivative) control. For information on ordering models with control, output and other options, see page P-53.

Model CN5002 Dual Setpoint Controller

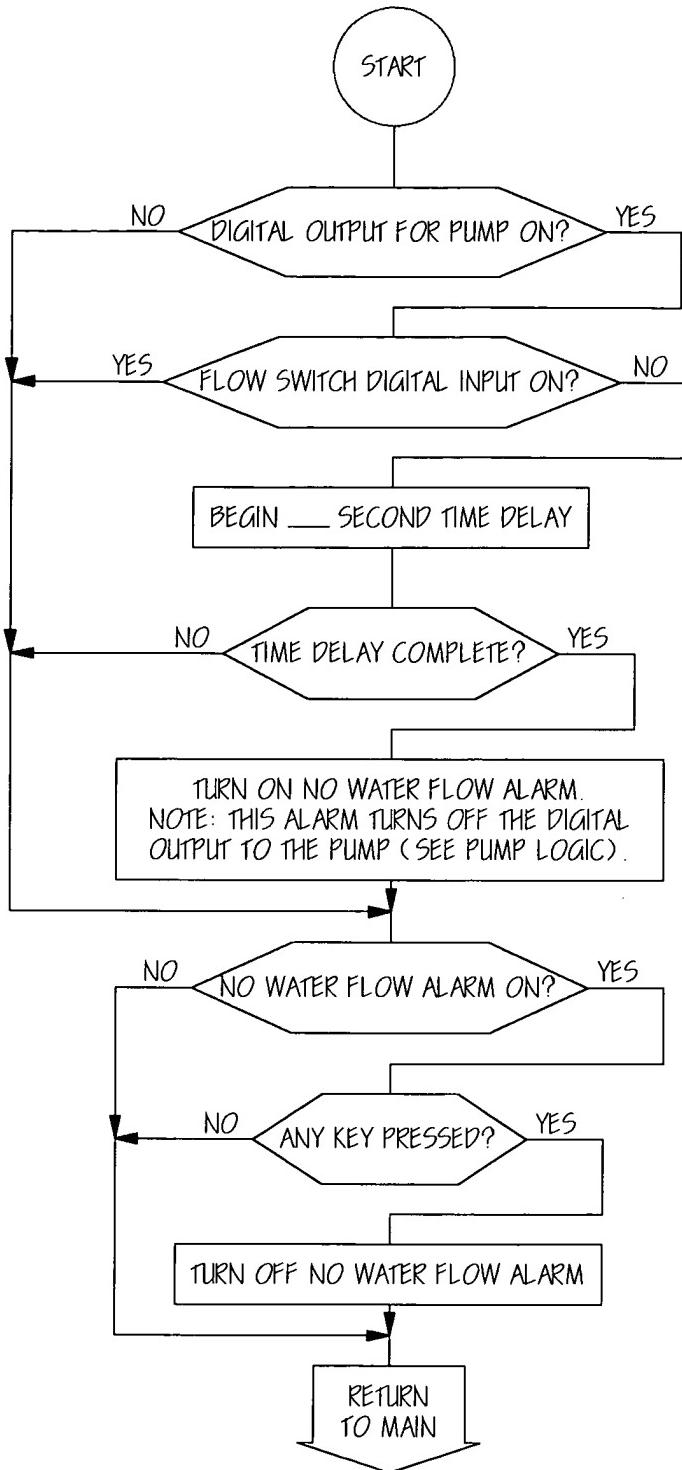
\$345

The first setpoint of the CN5002 incorporates the features of the CN5001 with the addition of an independent second setpoint and output. The second setpoint temperature may be set to any value within the full span of the controller, independent of the first setpoint. The second setpoint has an ON-OFF control, and a blind adjustment. For ordering information of non-standard models, see page P-53.

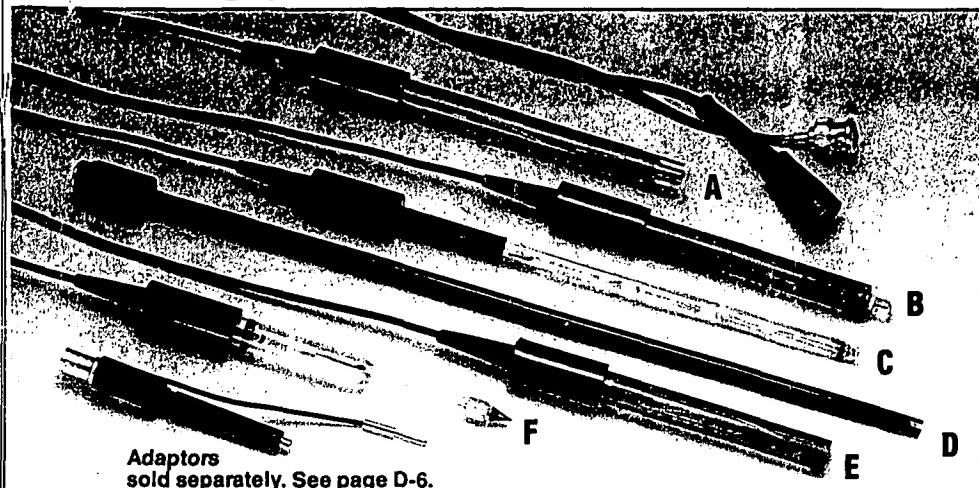




NO WATER FLOW ALARM LOGIC



Rugged G.F. Filled Electrodes



Adaptors
sold separately. See page D-6.

Discount Schedule

1-4 units	Net
5-9 units	5%
10-24 units	10%
25 and up	15%

Quantity discounts may be applied to
assorted quantities. Discount schedule
applies to page D-6 thru D-12 and D-20.

	Part No. BNC	Part No. U.S. Std.	Application	Insertion Length (mm)	Diameter (mm)	pH Range	Temp. °C
A	PHE-1311	PHE-1311-U	General Purpose	110	12	0-12	-5 to 80
A	PHE-1411	PHE-1411-U	General Purpose for Samples Requiring Double Junction	110	12	0-12	-5 to 80
A	PHE-1511	PHE-1511-U	For use with sulfides or other Contaminants found in plating baths and process streams	110	12	0-12	-5 to 80
B	PHE-1312	PHE-1312-U	General Purpose with removable bulb guard	110	12	0-12	-5 to 80
B	PHE-1412	PHE-1412-U	Double junction design for use with inter- fering ions such as zinc, copper or sulfide.	110	12	0-12	-5 to 80
C	PHE-1332	PHE-1332-U	Test Tubes	180	6.5	0-12	-5 to 80
C	PHE-1432	PHE-1432-U	Test Tubes for samples requiring double junction	180	6.5	0-12	-5 to 80
D	PHE-1335	PHE-1335-U	Extra long Test Tubes (detachable style shown)	300	6	0-13	0-100
E	PHE-1371	PHE-1371-U	Measurement of flat, moist surfaces such as meat or paper	110	12	0-12	-5 to 80
E	PHE-1471	PHE-1471-U	Measurement of flat surfaces for samples requiring double junction	110	12	0-12	-5 to 80
F	PHE-2381	PHE-2381-U	Extra rugged puncture tip for meats, cheeses, fruits, leather	55	8	0-10	-5 to 100
F	PHE-2881	PHE-2881-U	Extra rugged puncture tip (Calomel)	55	8	0-10	-5 to 60
F	PHE-2481	PHE-2481-U	Extra rugged puncture tip for samples requiring double junction	55	8	0-10	-5 to 100
G	PHE-2385	PHE-2385-U	Rugged puncture tip for meats, cheeses, fruits, leather	55	8	0-13	0-100
H	PHE-1317	PHE-1317-U	Economical with removable guard and Teflon® junction	110	12	0-13	0-100
H	PHE-1417	PHE-1417-U	Economical with double Teflon® junction	110	12	0-12	0-80
J	PHE-1304	PHE-1304-U	Economy	90	12.5	0-12	0-80
K	PHE-1301	PHE-1301-U	Economy	89	13	0-12	0-80
L	ORE-1311	ORE-1311-U	General Purpose-ORP	110	12	± 5000 mV	-5 to 80
L	ORE-1411	ORE-1411-U	Dbl. junction for interfering ions such as zinc, copper or sulfide-ORP	110	12	± 5000 mV	-5 to 80
L	ORE-1511	ORE-1511-U	For use with sulfides or other contaminants found in process streams-ORP	110	12	± 5000 mV	-5 to 80

All electrodes supplied with 3 ft cable. For other configurations, see page D-4.

For additional lead length add desired length as suffix to electrode number and add \$1 per additional foot.

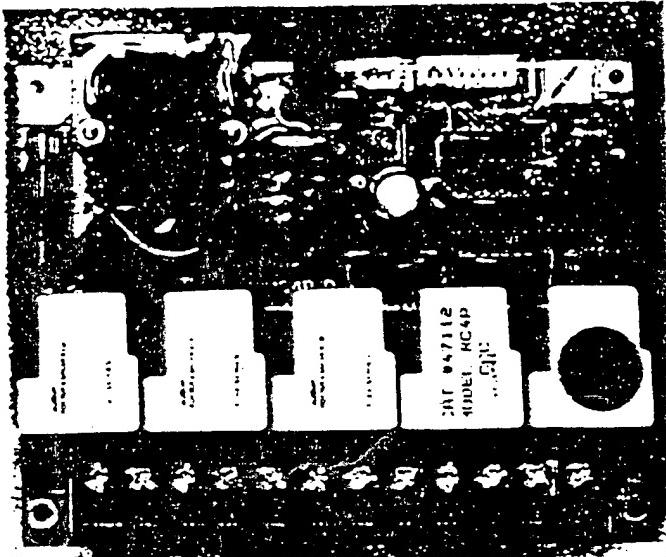


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HEATER

RC-4P

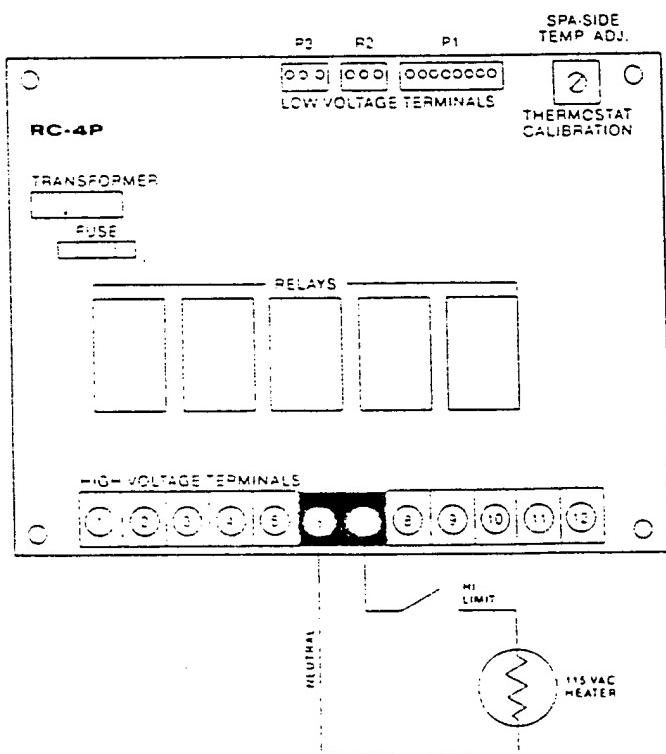
INSTALLATION GUIDE



Note:

- Be sure your heater has a high limit switch, as required by the National Electric Code (NEC 422-14a).

115 VAC



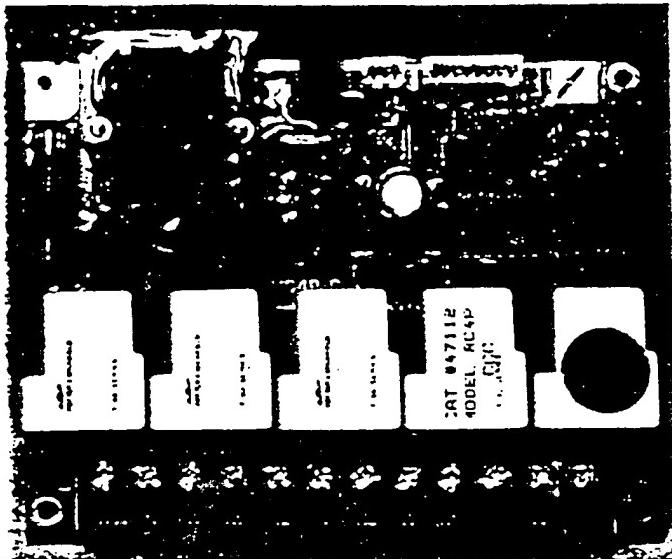


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BLOWER AND LIGHT OR OTHER ACCESSORIES

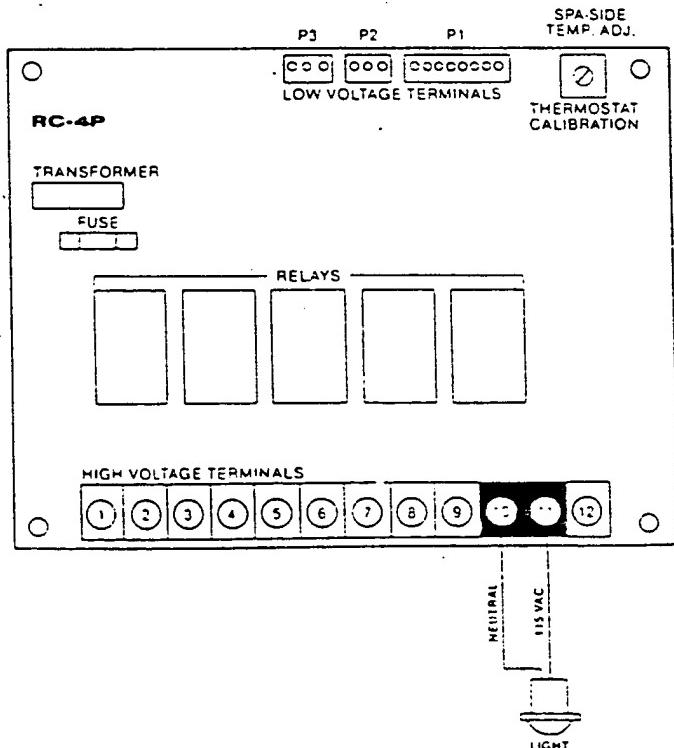
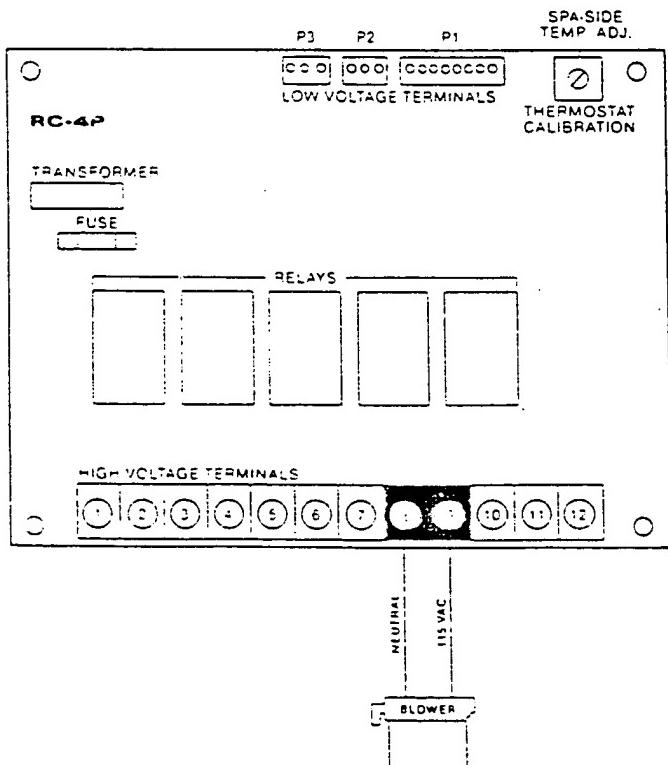
RC-4P

INSTALLATION GUIDE



"ACC" (UPPER RIGHT) 115 VAC ——
USUALLY BLOWER

"ACC" (LOWER LEFT) 115 VAC ——
USUALLY LIGHT



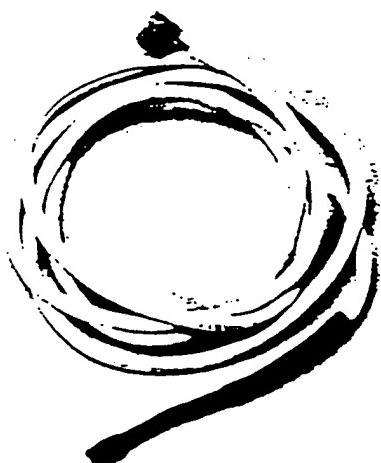
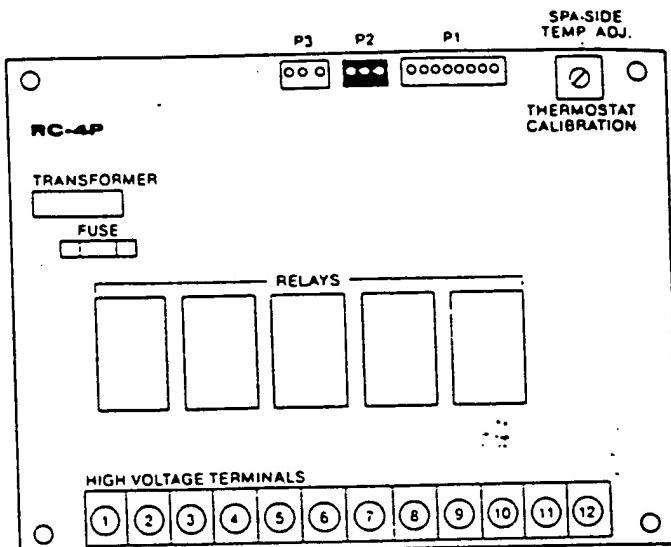
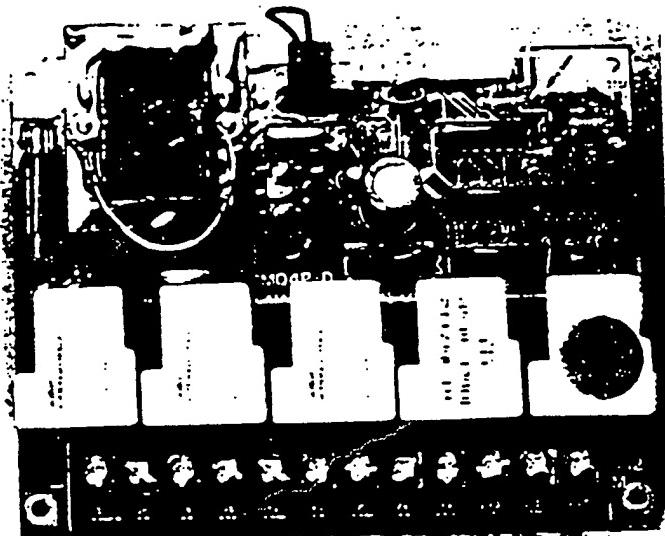


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RC-4P

TEMPERATURE SENSOR

INSTALLATION GUIDE



INSERTION TEMPERATURE SENSOR



GLUE-IN TEMPERATURE SENSOR

INSERTION

- Insert the sensor into the heater thermostat dry well. (Make sure it is NOT in the high limit dry well.)
- Seal the end of the dry well to hold the sensor in place.
- Run the cable to the circuit board. (Run cable through conduit if mechanical protection is needed.)
- Connect black IDS plug to low voltage terminal P2.

GLUE-IN

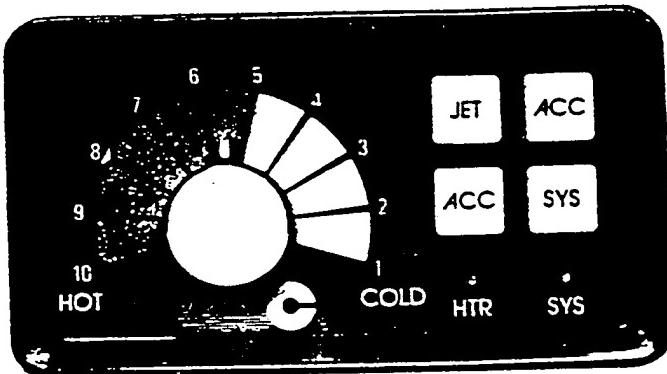
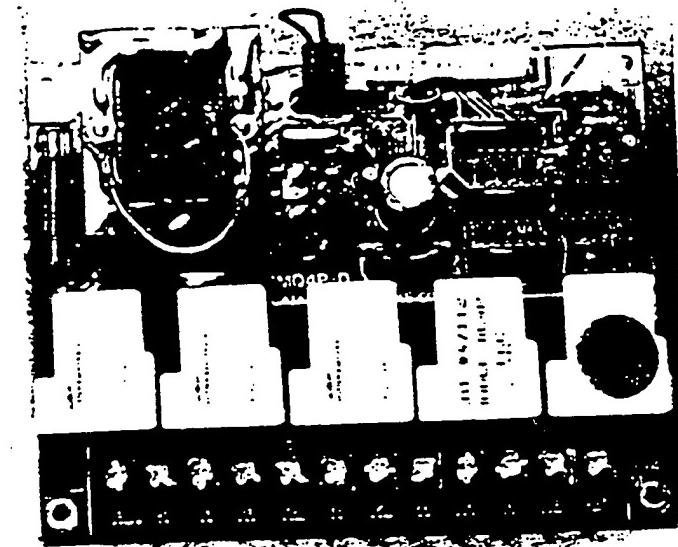
- Determine the location for sensor on the suction side of the pump or between the filter and heater (within reach of the temperature sensor cable.) Note: sensor glues directly into 1 1/2" PVC or ABS rigid pipe.
- Drill a 3/8" hole in the top of the pipe.
- Coat the pipe around the hole (a thin, even layer) with PVC or all-purpose PVC-ABS primer and glue. (Do not coat the sensor).
- Push sensor into the hole and hold firmly until glue sets (approximately 45 seconds).
- Run the cable to the circuit board. (Run cable through conduit if mechanical protection is needed.)
- Connect black IDS plug to low voltage terminal P2.



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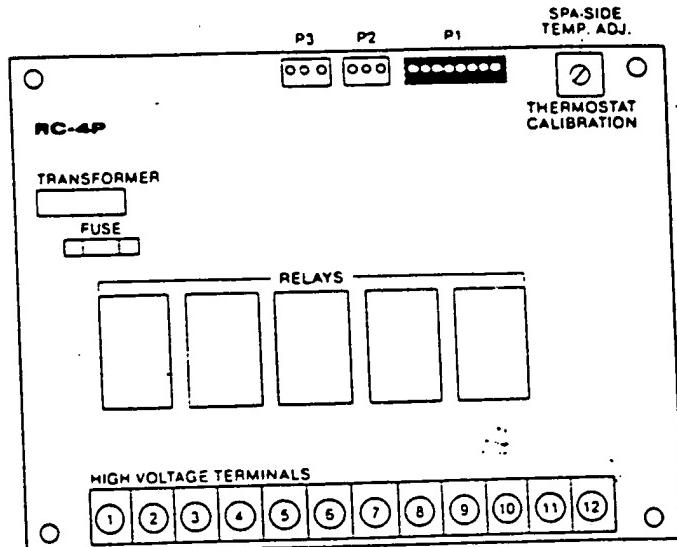
SPA-SIDE PANEL

INSTALLATION GUIDE



SPA-SIDE PANEL

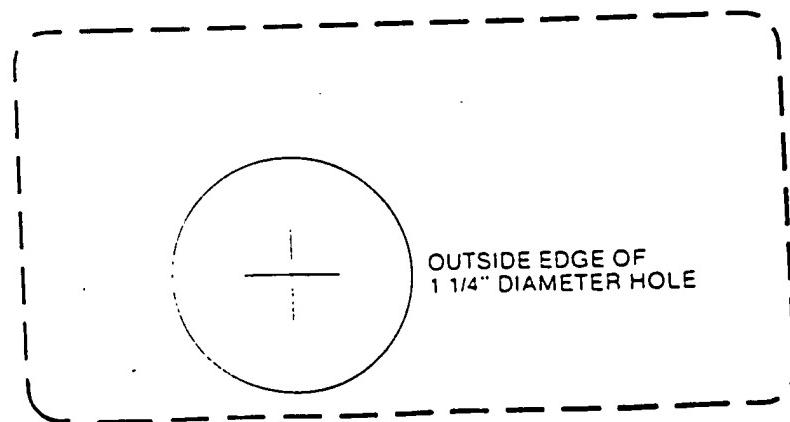
- Determine location for spa-side panel. (Do not install under the sealed area of the spa hard cover.)
- Using template below, drill a 1 1/4" diameter hole.



- Run the cable through the hole to the circuit board. (Run cable into conduit if mechanical protection is needed. Do not mount spa-side panel at this time.)
- Connect black IDS plug into low voltage terminal P1.
- Fill spa with 55° F to 104° F water.
- After heater, pump and accessories have been connected, test all functions from the panel (BEFORE mounting the panel).
- Mount the spa-side panel by peeling off the self-adhesive backing. Press onto dry, non-oily, non-porous surface.
- The thermostat is pre-calibrated at Catalina Controls. It should not require adjustment. If you desire to recalibrate, go to THERMOSTAT CALIBRATION.

TEMPLATE

TOP OF PANEL



OUTSIDE EDGE OF
1 1/4" DIAMETER HOLE

OUTSIDE EDGE OF PANEL

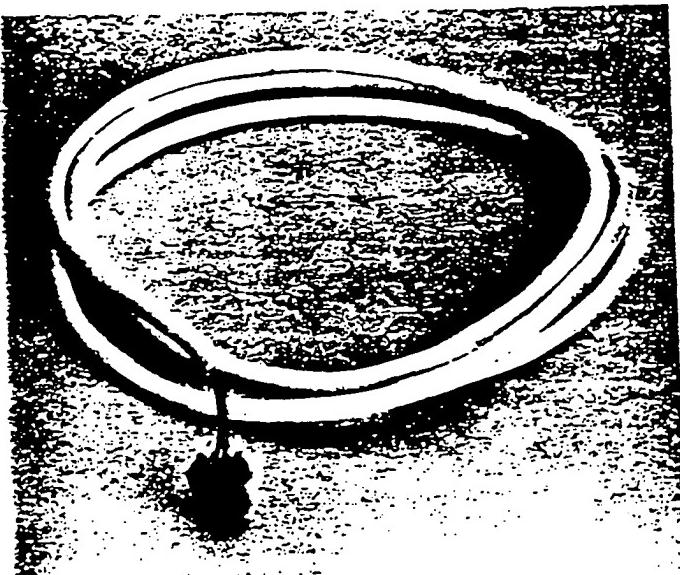
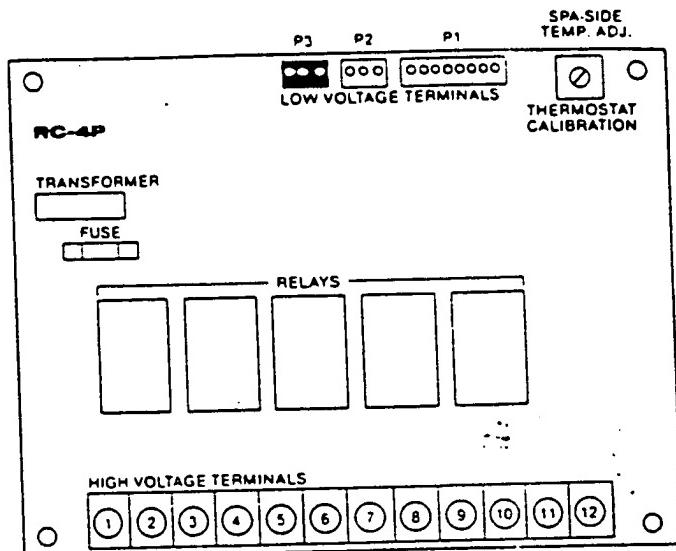
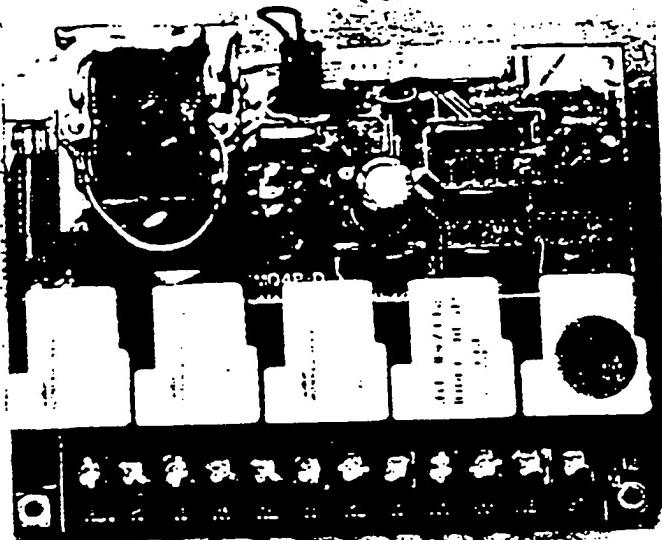


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RC-4P

PRESSURE/FLOW SWITCH OPTION

INSTALLATION GUIDE



PRESSURE/FLOW SWITCH PIGTAIL

- Connect leads from 3-foot pigtails with black IDS plug to pressure or flow switch.
- Run the cable to the circuit board. (Run cable through conduit if mechanical protection is needed.)
- Remove jumper from low voltage terminal P3.
- Connect black IDS plug (with pigtails to pressure or flow switch) to low voltage terminal P3.

Note:

- If pressure/flow switch is not a selected option, low voltage terminal P3 must have a jumper.

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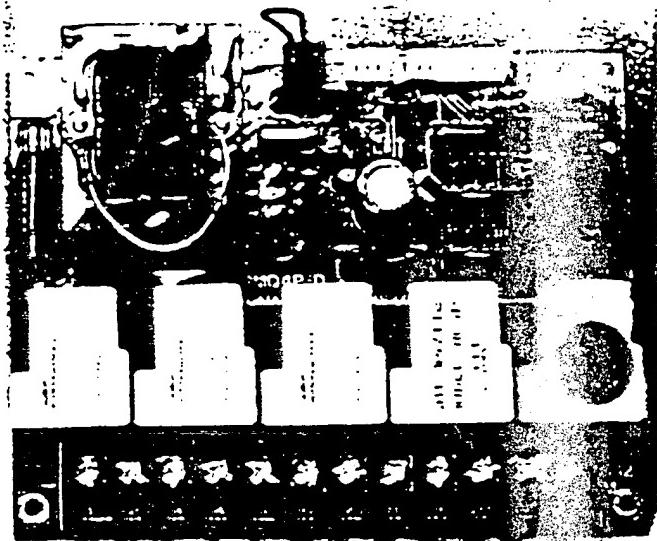


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THERMOSTAT CALIBRATION

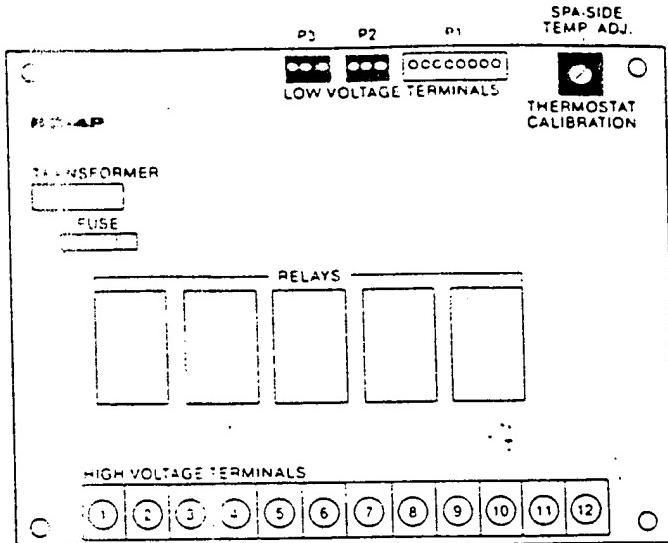
RC-4P

INSTALLATION GUIDE



FIXED TEMPERATURE RESISTOR

- Remove black IDS plug from low voltage terminal P2.
- Connect Fixed Temperature Resistor to low voltage terminal P2.
- Remove black IDS plug from low voltage terminal P3.
- Connect jumper to low voltage terminal P3.
- Turn power on.



- Turn thermostat to 101° F(7), then slowly higher to 103° F(9).
 1. If "HTR" light is OFF... Turn thermostat calibration screw until the instant the "HTR" light goes on.
 2. If "HTR" light is ON... Turn thermostat to 102° F(8). Then turn thermostat calibration screw until the instant the "HTR" light goes off.
- Check calibration by turning the thermostat to 101° F(7). "HTR" light should have gone off. If light is on, recalibrate until the instant the "HTR" light goes off. If light will not go out or if you cannot calibrate to a range between 101° F(7) and 103° F(9), then troubleshoot the system. If you have already troubleshooted the spa-side panel, heater and temperature sensor, then replace the circuit board.
- Remove Fixed Temperature Resistor from low voltage terminal P2.
- Reconnect black IDS plug (with cable to temperature sensor) to low voltage terminal P2.
- Remove jumper from low voltage terminal P3.
- Reconnect black IDS plug to low voltage terminal P3.